BERMUDA

REPORT

OF THE

Department

OF

Agriculture

FOR THE YEAR

1925

PRINTED BY
THE MID-OCEAN PRESS
FRONT STREET, HAMILTON, BERMUDA.

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Board of Agriculture, 1925.

Honble. J. P. HAND, M.B.E., M.C.P., Pembroke, *Chairman.*

Mr. E. F. ZUILL, M.C.P., Devonshire, *Vice-Chairman.*

Mr. B. C. C. OUTERBRIDGE, M.C.P., Smiths.

Mr. W. A. H. BARNES, Southampton.

Mr. H. E. D. SMITH, St. Georges.

Mr. J. DE MOURA, Southampton.

Mr. J. H. HOLLIS, Hamilton Parish.

Wor. T. H. H. OUTERBRIDGE, J.P., M.C.P., Hamilton Parish.

Mr. W. J. H. TROTT, Pembroke.

TEMPORARY APPOINTMENTS.

Honble. S. S. SPURLING, C.M.G., O.B.E., M.C.P., St. Georges.
20th August to 23rd October.

Mr. J. D. B. TALBOT, M.C.P. Pembroke.
20th August to 19th October.

Department of Agriculture, 1925

Director of Agriculture, E. A. MCCALLAN.

Plant Pathologist, LAWRENCE OGILVIE. M.Sc., M.A., B.Sc.

Inspector of Produce, G. E. WINTER.

Government Veterinary Officer, R. L. TUCKER, D.S.V., (Part-time officer.)

First Agricultural Assistant, W. R. EVANS.

Clerk, G. L. YOUNG.

Assistant Inspector of Produce, E. L. ADAMS, (Part-time officer).

Sub-Inspectors of Produce, T. A. HOLLIS, Jr., M. J. KING, C. V. S. EARLY, (Part-time officers.)

Agricultural Station,

Bermuda,

15th June, 1926.

Sir,

I am directed by the Board of Agriculture to lay before His Excellency the Governor, for the information of the Legislature, the accompanying report of the Department of Agriculture for the year ended 31st December, 1925.

I have the honour to be,

Sir,

Your obedient servant,

G. L. YOUNG.

Clerk, Board of Agriculture.

The Honourable

The Colonial Secretary,

Hamilton.

Report of The Director of Agriculture For the Year 1925.

The Chairman,

Board of Agriculture,

In accordance with the provisions of The Agricultural Department Act, 1921, I have the honour to submit my report for the year 1925. Reports of other members of the Department are also submitted.

AGRICULTURAL STATION.

A narration of the principal work performed at the Agricultural Station during the year under review follows:

Potatoes.—The selection of disease-free high yielding strains of seed potatoes continues to receive attention. A large measure of success has attended efforts made with relation to Garnet seed, but equal success has not been reached with respect to Triumphs.

Triumphs.—The strain named below were planted in the Au tumn of 1924, and were found to contain the following percentages of leaf-roll and mosaic; and when dug in January, 1925, gave the following yields:

	Leaf-roll.	Mosaic.	Pounds per rod.
(1) Batavia-Long Island	29.5%	2.9	63
(2) New Brunswicker	.35	28.8	71.9
(3) Belmont, N.Y.	1.4	27	68.9
(4) Unknown, imported by farmer for own use	34.7	64.2	51

The above figures refer to small plots planted late, on 24th October. The main plots, planted on 30th September, included strain (1) and another strain, that from Amos Radcliffe, Eagle River, Wisconsin.

Owing to very high winds of 11th to 13th November these plots were badly injured and the yields were extremely low. Batavia-Long Island seed gave smaller yields throughout than did the Wisconsin-Long Island seed .

The following strains were planted in March, and counts of leaf-roll and mosaic infestation gave the following results:

Strain	Leaf-roll	Mosaic.
(1) Maine-grown, furnished but not recommended by Dr. H. C. Sands	6	37

(2) Wisconsin-grown, from Amos Radcliffe	Nil	16
(3) New York-grown, from Hickox-Rumsey.....	2	28
Nebraska-grown, furnished by Prof. H. O. Werner		
(4) grown by John Neilson.....	Nil	Nil
(5) grown by F. G. Rowley	Nil	Nil
(6) grown by Antone Stenberg ...	Nil	Nil

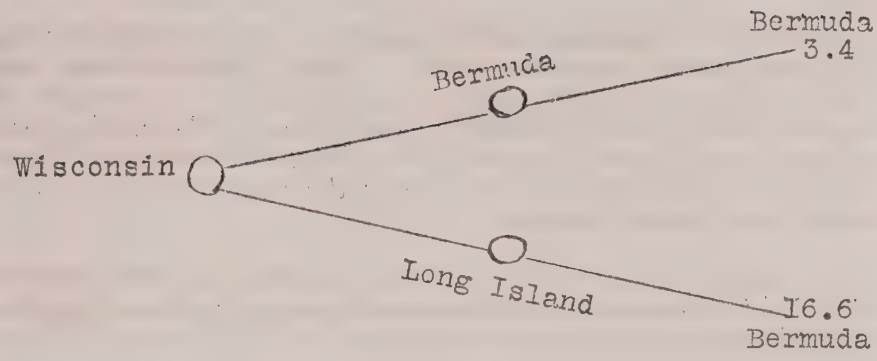
Seed from these stocks was planted on 1st September, a date which proved to be too early, for extremely poor stands were obtained. The following percentages of leaf-roll infestation were observed: (1) 59, (2) 3.4, (3) 4.2, (4) 0, (5) 0, and (6) 0.

In the Autumn of 1925 seven strains of imported Triumphs were planted, Nos. (1) to (4) on 15th October and the remainder on 17th December, and the following percentages of leaf-roll and mosaic were observed:

Strain	Leaf-roll.	Mosaic.
(1) Wisconsin-Long Island	16.6	9.7
(2) Belmont A	8.02	15.5
(3) Belmont B	6.9	22.5
(4) Nebraska	Nil	Nil
(5) New Bruswick (N.B.)	4.5	79
(6) New Brunswick (xx)	2.1	86.2
(7) New Brunswick (MC)	.7	93.5
(8) Atlanta, N. Y.	5.3	52.6

For the first time spindle tuber is recorded in Bermuda, having been observed in strain (4) and in (8).

Of special interest is the relative spread of leaf-roll observed in Wisconsin seed (a) twice planted in Bermuda after direct importation from Wisconsin, and (b) planted in Long Island fron Wisconsin stock and in Bermuda from Long Island stock. In the two cases the increases were as follows:—



Leaf-roll infestation as high as 30 per cent was observed in (b) on farms.

Garnets. Six strains of Garnets from Nova Scotia and one from New Brunswick were planted on 19th February. None were infested with mosaic, and only one with leaf-roll, and that very slightly, .66 per cent. A small sample was received from the Ontario Agricultural College, and was free from both the diseases named. The yields of Garnets were very small because of weather conditions made unfavourable by excessive rains followed by a period of drought. The New Brunswick seed cropped poorer than did the Nova Scotian. Reference was made in the last report to the superiority of one Nova Scotian strain with respect to yield, and in the tests of 1925 this strain again led.

Irish Cobblers.—A small planting was made of this variety. The yield was good and the table qualities excellent. The variety is becoming deservedly popular for local consumption.

Heavyweights.—This variety does not appear to be suitable to Bermuda.

Varietal Tests.—Small plots of Heavyweights, Irish Cobblers, Garnets and Triumphs were planted on 17th October. The highest yield was obtained from Irish Cobblers. Dusting and spraying controlled potato blight in all varieties.

VEGETABLES.—Germination of Seeds.— During the year 290 samples of vegetable seeds were tested for germination, including 108 samples tested under The Agricultural Inspection Act, and referred to elsewhere. Of the total about 33 per cent did not germinate satisfactorily in the field, but of the number which failed to give satisfaction less than 7 per cent were seeds of important vegetables. In arriving at an estimate of the viability of seeds imported into Bermuda it should be remembered that because of the season of the year in which we buy, all seeds are at least a year old, and that, further, our

climate is delecterious to seeds held for sowing. In the case of vegetable seeds, at least, failure to germinate is more often the fault of the sower than of the seed.

Export Vegetables.—With respect to export vegetables the following observations are made. Early Egyptain beet and similar types are recommended, and the further importation of seed of Crosby's is prohibited by Regulation. The strains tested vary greatly, and, as a rule, the English strains and those from American houses which supply the Southern States have been found the most reliable.

Severe loss is occasioned every year through the injury of beets by "fire-worms," but is has been repeatedly proved that this is easily controlled by arsenical poisons.

Carrots vary greatly in type, and Chantenay is recommended in preference to Danvers. Some French varieties appear to be excellent after brief trial. Frequent reference is made by the Inspector of Produce of excessive growth of leaves of both beet and carrot. While this is to some extent dependent on variety, it is frequently aggravated by the too liberal use of nitrate of soda.

No celery land is included in the Agricultural Station, and therefore no tests can be made. Clause's Golden Self-Blanching is strongly recommended. Celery seed was examined by the Plant Pathologist for infection by blight (**Septoria apii**), and very satisfactory arrangements were made with M. Clause with respect to freedom from disease in future importations.

Lettuce varieties are tested every year, but the objective, a large, quickly heading, good shipping variety has not yet been found. Sutton's Mammoth White and White Heart are recommended. A few French varieties are promising, especially Vilmorin's Provence.

There appears to be little choice in the many varieties of unmixed curled parsley. Quite a few importations, however, contain seed of flat-leaved varieties. While there exists a limited market for flat parsley, it does not crop as heavily as does the curled, and mixture of seed is always objectionable.

Domestic Vegetables.—Increased attention is being given to the cultivation of vegetables for domestic consumption, and during the year under report an unusually large number of new and little-cultivated vegetables were under test. Comment on these must be reserved until next year, but the following are mentioned as among those which can be successfully grown here, and yet are seldom offered for sale, though occasionally grown in home gardens: Borecole, endive, Georgia collards, kohl rabi, leeks, mustard, okra or gumbo, parsnip, edible-podded peas, salsify and Swiss chard.

Jersey Island grown seed of Sunset tomato was tested late in 1925, and again planted for test in 1925-1926. It appears to

be a valuable addition to the varieties of tomatoes suitable for cultivation in Bermuda.

Summer Vegetables.—Because of changes made in the lay-out of the plots, practically no summer crops except cowpeas and soy beans were planted.

Onions.—Six strains of onion seed from Teneriffe and California were tested in 1924-1925. The seed was sown on 28th October (1924), and five samples germinated satisfactorily. The crop was harvested on 8th May (1925) and the highest yield was obtained from California-grown seed, which showed greater freedom from admixture of pink and crystal wax bulbs, although all samples were satisfactorily free. As in previous years, the seed was allowed to mature without being transplanted, and for this reason contained a relatively high percentage of bottle-necked bulbs.

Green Manuring.—The usual summer practice of planting legumes for green manure was continued. Cowpeas were planted by drill in a well-fitted field on 18th June. A light rain had fallen in the morning, and the peas germinated very promptly and grew rapidly, despite the low rainfall in June, so that in sixty days a crop of 12 to 14 tons was plowed under. In other fields the seed was covered with the plow, and in no case were the stands and yields satisfactory. Two essentials in growing cowpeas are thorough preparation of the seed-bed and careful seeding.

It is pleasing to record that farmers sowed an increased acreage to cowpeas last summer. The benefits of the practice of leguminous green manuring are presented under "Soil Improvement: Green Manuring."

Fruit. An extremely small crop of citrus fruit was gathered, but the trees give promise of cropping well in 1926. As usual, loquats bore well, and were relatively free from fruit-fly injury. The only control practised was the destruction of fallen fruit.

Flower Beds, Lawns and Glasshouses.—The flower beds, lawns and glasshouses were maintained in good order. The grounds around the Exhibition buildings were graded and planted to grass. English roses planted on 31st December, 1924, were in bloom on 15th February, 1925.

Several donations of seeds and plants are gratefully acknowledged.

On 27th February Miss Doris K. Turnbull, lady gardener, terminated her engagement with the Department.

Growing Trees For Arbor Societies. At the suggestion of His Excellency the Governor the sum of £100 was placed on the estimates and appropriated for the purpose of growing trees for the Arbor Societies. The Societies were asked to submit their requirements, but only Pembroke responded. Already

a number of trees had been propagated for distribution, and in the Autumn palms and other plants were imported. During the year a small number of trees were taken from the nursery rows at the Station and planted in Hamilton by the Pembroke Arbor Society. These were chiefly **Sebesten Sebestena** and **Casuarina equisetifolia.** A fairly large number of the latter were sold at nominal prices, but the majority have not survived transplanting.

Live Stock—At the close of the year the farm live-stock of the Department consisted of the following animals:

Guernsey Cattle.

Albamont Titian (76061); sire, Albamont Raier of Linda Vista; dam, Spalding of Gerar; born, 21st September, 1921; breeder, J. C. Haartz, Campton, N.H.

Montrose Sovereign (160380); sire, Albamont Sovereign; dam Dora of Atwood's Dairy; born, 6th January, 1922 (at Agricultural Station); breeder, J. C. Haartz, Campton, N.H.

Albamont Argonaut (888459); sire, Cramond Defiance; dam, Albamont Forget-me-not; born, 31st December, 1922; breeder, A. M. Haartz, Campton, N.H.

Montrose King (106391); sire, Montrose Sovereign; dam, Albamont Juliet; born, 29th September, 1924; breeder, Department of Agriculture.

Montrose Defiance; sire, Albamont Argonaut; dam, Dora of Atwood's Dairy; born, 16th January, 1925; breeder, Department of Agriculture.

Dora of Atwood's Dairy (73697); sire, Jethro's Squire of Maple Ranch; dam, Idol's Ellen; born, 7th January, 1917; breeder, Est. of John Hopewell, Natick, Mass.

Albamont Juliet (85736); sire, Deanie's May King; dam, Juliana of Gerar; born, 20th April, 1918; breeder, J. C. Haartz, Campton, N.H.

Juliana of Montrose; sire, Montrose Sovereign; dam, Albamont Juliet; born, 1st November, 1925; breeder, Department of Agriculture.

Berkshire Pigs.

Highwood Model 209th, (332648), male; sire, Highwood Model 139th; dam, Highwood Duchess 224th; born, 6th November, 1924; breeders, H. C. & H. B. Harpending, Dundee, N.Y.

Highwood Starlight 282nd and 283rd, (332649) and (332650), two females; sire, Highwood Model 190th; dam, Highwood Starlight 250th; born, 6th May, 1925; breeders, H. C. & H. B. Harpending, Dundee, N. Y.

Toggenburg Goats.

Mayfly of Lorraine (18970), male; sire, Steven's Antonio; dam, Ace's Maytime; born, 10th March, 1922; breeder, S. F. Cowling, Middlestown, Va.

Nancy, (J,T.H. No. 2), female; sire, El Chivat's Uncas II.;dam, U.S.D.A. No.199; breeders United States Department of Agricultrue

Nan, Nellie and Nora, three females; sire, 15/16 Toggenburg; dam, Nancy; born, 26th April, 1925, (at Agricultural Station); breeders, United States Department of Agricultuure.

The bull Albamont Titian was sold on 18th August, to Mr August Teceira, Jr., Southampton; on 9th September Montrose King was sold to Mr. H. E. D. Smith, St. Davids and on 4th November Montrose Defiance was sold to Mr. Henry Johnson, Baileys Bay. In every case the price was nominal.

On 1st November Albamont Juliet gave birth to a heifer calf Juliana of Montrose, by Montrose Sovereign. At the close of the year Dora of Atwood's Dairy was due soon to calve, by Argonaut. It is wothy of note that Albamont Forget-me-not, dam of Argonaut, recently made an Advanced Registry record of 13,158.3 lbs. of milk, and 729.5 lbs. of butter fat, and that his grand-sire Don Diavolo of Linda Vista has an unusually large number of daughters in the Advanced Registry. The health of the dairy animals was good generally. The two bulls standing for service at the Station, Sovereign and Argonaut, are not as active as desirable, and are being exercised.

Improvement was effected in the stables by putting down a concrete floor.

Three Berkshire pigs were purchased from Messrs. H. C. & H. B. Harpending, Dundee, N.Y., and arrived here on 20th July. All have grown well since arrival. The boar made 19 services. The two sows will be bred when about ten months.

The Toggenburg buck served 23 does during the year. The grade Toggenburg doe Nancy, purchased from the United States Department of Agriculture, was imported in February and gave birth to three doe kids, Nan, Nellie and Nora, on 26th April. The mother is now in kid by Mayfly of Lorraine, and it is proposed to breed the young does and sell two.

Success did not follow the Department's first efforts at chicken raising, for intestinal parasites caused high mortality among them. A few cockerels were sold to farmers for breeding purposes, and fourteen pullets were placed in the laying house. Light Sussex eggs imported from England produced some healthy chicks.

The Department is under obligation to the Governors of the Hospital for quarters for the live stock attendant.

Egg-Laying Contest. Information regarding the two egg-laying contests will be found in the report of the First Agricultural Assistant.

Disposal of Milk, Eggs and Vegetables. The calves are fed whole milk, and most of the surplus is given to the Hospital. Eggs from the contest are sold, by arrangement with the owners, and

the cost of feed and attendance is paid from the sales. Vegetables are sold locally and in New York, and given to public institutions. The value of the produce disposed of is given in Appendix B.

Agricultural Students. Two students were appointed on 22nd January, and were in attendance from 2nd February. They receive practical instruction, and lectures are given during the winter months. Opportunity to attend these lectures, which are chiefly on botany and chemistry by the Plant Pathlologist, is extended to the senior scholars of all Schools, but little response is made.

Visitors. Visitors to the Station during the year included His Excellency the Governor, Sir J. J. Asser; Mr. R. A. Wiseman of the Colonial Office, and Mr. Anthony Berg of West Virginia University. A large number of visitors pass through the Station annually.

Office Work. The clerical work of the office included correspondence, 1,204 letters were received and 1,589 dispatched, an increase of 10 per cent over that of the previous year; preparation of copy for the monthly bulletin; preparation of reports; publication of market information; and issue of inspection certificates. The clerical work of the Annual Agricultural Exhibition was performed with additional assistance costing £30—6—0. Bulletins received from exchanges were nearly all indexed and filed. The Clerk is also required to perform work arising out of the meetings and activities of the Board which held twenty-six meetings during the year.

No reference is made above to duties connected directly with experimental, research, inspection and other work which constantly demand the attention of the Department, nor to the more important duty of disseminating information to farmers.

Office hours are nominally from 8.30 a.m. to 5 p.m., but without exception all members of the Department work overtime. It is probable that the members of the Department of Agriculture, because of the nature of their duties, are called upon to work longer hours without overtime fees than are any other members of the Civil Service.

Repairs and Extension of Buildings, Fences, Etc. The offices were repainted by the Works Department, and iron water tanks placed near the stables. A laying house and feed-room were built for use in connection with the egg-laying contest, and trap nests, designed by the First Agricultural Assistant, were made. A fence was constructed around the south orchard, and the renewal of the west boundary fence was not completed at the end of the year. The bull paddock fences were repaired. These fences of No. 9 wire proved to be sufficiently strong to confine the animals but the lower wires were damaged by the bulls getting their heads underneath. Had they been built close to the ground they would have been little damaged. Much of the repair work not done by the Works Department was carried out during the sum-

mer by Station workmen under the direction of the Acting Inspector of Produce. A new field of about seventy-five rods was prepared for cultivation. The removal of the rock was performed by prison labour, which was also employed in the construction of a new drive-way not yet completed.

Botanic Garden. During the last two years consideration has been given to the establishment of a Botanic Garden in connection with the Station. The subject was first brought to the attention of the Board in the Director's annual report for 1922, and on his return from England in September, 1924, the Director laid before the Board the views of several botanical experts, notably those of Dr. Arthur W. Hill, Director of the Royal Botanic Garden, Kew, and his own observations on the subject. The value of Botanic Gardens operated in conjunction with Agricultural Stations is recognised everywhere, and particularly within the Empire, for example, the first (1924) annual report of the Department of Agriculture of the Gambia contains these words, "an area of not less than fifty acres of land must be set aside for the establishment of a properly equipped Agricultural and Botanic Garden." Is Bermuda's need any less urgent than is the Gambia's ? Briefly the functions of a Botanic Garden, as outlined by Dr. Hill, are educational, scientific and economic. The establishment of such a garden in connection with this Station calls for no initial expense, and the annual cost should not exceed one thousand pounds. Its establishment should be proceeded with without delay.

Rainfall. The rainfall at the Station was recorded by the Secretary of King Edward VII Memorial Hospital, and the weekly records are here given:

Jan.	3.	.64	July	4.	——
	10.	1.99		11.	1.56
	17.	.82		18.	.83
	24.	1.33		25	.88
	31.	1.18	Aug.	1.	3.36
Feb.	7	.75		8.	1.79
	14.	.63		15.	2.77
	21.	4.16		22.	.90
	28.	1.00		29.	2.10
Mar.	7.	6.21	Sept.	5.	.85
	14.	.62		12.	.27
	21.	.22		19.	2.69
	28.	.57		26.	1.72
Apr.	4.	.96	Oct.	3.	.04
	11.	.63		10.	.79
	18.	.71		17.	.33
	25.	1.14		24.	1.83
May	2.	——		31.	1.77
	9.	1.20	Nov.	7.	1.56
	16.	.94		14.	.71
	23.	.05		21.	2.13
	30.	4.54		28.	1.48
June	6.	.38	Dec.	5.	2.66
	13.	——		12.	1.39
	20.	.54		19.	.20
	27.	——		26.	.16
				31.	.97

Total for year, 66.95 inches.

AGRICLUTURE IN 1925.

The agricultural year under report was one of small crops and low prices generally for most exported produce. Lily bulbs alone were in increased quantity, and prices were maintained with respect to bulbs and potatoes, and for onions were above those of recent years.

The quantities of produce (exclusive of lily bulbs) exported during the last ten years are given below:

1916	548,862	bushels
1917	541,126	"
1918	382,325	"
1919	538,126	"
1920	513,938	"
1921	470,225	"
1922	379,082	"
1923	318,761	"
1924	416,604	"
1925	313,280	"

The quantity exported in 1925 was 75 per cent of the yearly average of the last decade.

Average New York prices of green vegetables in 1924 and 1925 follow. The Department is indebted to the Whitney Institute for compiling these figures.

	1924	1925
Beets	$1.44	$1.32
Carrots	1.67	1.29
Celery	7.44	2.94
Lettuce	1.91	1.42
Parsley	4.90	1.45

Onions averaged $1.77 and $3.02 in 1924 and 1925. It is more difficult to arrive at the average prices of potatoes which were in the neighbourhood of $13.00 and $14.00.

Celery was seriously affected with blight **(Septoria apii)** which reduced the yield, potatoes were reduced in quantity by unfavourable weather conditions and inferior seed, and onions because of shortage of seed.

The approximate or estimated local values of all agricultural produce for the year 1925 follow:

Vegetables exported to the United States	£83.000
Vegetables exported to Canada	4,500
Vegetables exported to West Indies	2,500
Lily bulbs exported (chiefly to United States)	14,500
Vegetables consumed locally	44.000
Bananas consumed locally	14,000
Milk consumed locally	61,000
Eggs and poultry consumed locally	25,000
Meat, chiefly pork	22,000
	£270,500

The above estimate of production is seventy-four per cent of the estimated production of the previous year, and with respect only to exports, fifty-four per cent.

AGRICULTURAL EDUCATION.

During the year under review much consideration was given to ways whereby the economic condition of the Bermuda farmer might be improved. Only one palliative will be here considered, for it appears to offer the most.

Today the farmer's chief concern is buying and selling, and his most important farm practice is the scientific control of the enemies of his crops; "certainly this is not a subject for inefficient persons." Investigations made in many farming localities in the United States of America have established the fact that, as a rule, the more highly educated is the farmer the larger are his earnings. For example, Kansas Agricultural College investigated 1,237 farms, and in every case recorded the educational status of the family. Here are the results:

Degree of Education	Average Annual Earnings
Common School	$422.00
High School	564.00
College, partial course	859.00
College, complete course	1452.00

So much for the wage earning capacity of education. More recent investigations have enquired into "the standard of life" on certain New York farms, that is, "the measure of life as evidenced through the acquisition and expenditure of income, and through the use of time in the satisfaction of wants for things both material and spiritual." After an exhaustive survey of his subject the (1) author included in his conclusions the following: "education of parents and children bears a very significant relation to the standard of life, and education of children is more closely related than is education of parents. Apparently, inclination to keep the children in school is a more significant index of a high standard of life than is the tendency to cultivate more acres, to invest more capital or to employ more labour."

The survey extended over a period of more than two years, and established the value of education on New York farms. Should not education prove equally effective in raising the standard of life on Bermuda farms ?

NOTES ON MARKETING.

During the year 1925 produce, other than lily bulbs, was shipped to our markets in the following proportions:

United States of America	92.7 per cent
Dominion of Canada	5.0 " "
British West Indies	2.3 " "

After long consideration a new type of bushel crate was approved by the Board, and its experimental use recommended. This crate possesses the following advantages over the one so long in use: it is cheaper, stronger, more attractive, and better ventilated. Its use is strongly recommended.

Certain adjustments of custom tariffs on agricultural imports were recommended by the Board with the object of giving increased protection to farmers and greater relief to consumers, but these recommendations did not find favour with the Legislature, as the following shows:

Recommended by Board.	Passed by Legislature.
Bananas, increase from 2/6 to 5/- per bunch.	10/- per bunch
Eggs, six pence per dozen from 1st January to 30th June, and free remainder of year.	Three pence per dozen throughout year.
Potatoes, delete January, February and March from period in which 4/- per bushel is in effect.	Months of January, February and March included in period in which 4/- per bushel is in effect.

In order to comply with the provisions of The Root Vegetable Act of Canada in respect to onions exported to that country, Regulations governing the exportation of that vegetable were amended in the following particulars, such amendments governing exports to all countries:

The following sizes were substituted for those previously specified:

Fancy, minimum size of 3 inches.
Choice, minimum size of 2 inches.
Standard, minimum size of 1¼ inches.
Boiler, minimum size of ½ inch.
Ungraded, not meeting the requirements called for in the above-named; on such the words "not graded" shall be marked.

Quality or grade was more fully described and made to include "properly cured."

Other amendments referred to the making of crates.

At the close of the year a bill similar to The Shipment of Produce to Canada Act, 1923, but governing the shipment of onions, potatoes and green vegetables to all markets, was under consideration by the Legislature.

New York.—New York continues to be our principal market. As already stated, prices of green vegetables were extremely low throughout the season, though good for onions and potatoes. To find relief for the depressed vegetable market, the Board engaged Mr. A. J. Gorham to investigate markets outside of New York. Mr. Gorham was absent from the Colony from 9th May to 14th June, during which time he was very active in our interests. His report included the following recommendations:

(1) A representative should be in New York throughout the season.

(2) Drastic changes should be effected in methods of grading, and packing centres are suggested.

(3) Onions should not be faced.

(4) The number of celery in crates should be marked on containers.

(5) Box material should not be over-bought, and carried over to the following season.

(6) Not more than six firms should handle any one commodity; three would be better.

(7) One firm in each of the following cities, which are considered to be good potential markets, should be appointed to push the sale of Bermuda vegetables: Philadelphia, Pittsburg, Cleveland, Detroit, Buffalo, Boston, Montreal and Toronto.

(8) At least half of our exported crop should be sold outside of New York.

(9) A distinctive first-class trade should be our aim.

(10) Bermuda should be given desirable publicity through the sale of her high grade vegetables.

(11) The Trade Development Board should devote space to advertising Bermuda vegetables.

During the year under report payments were made to the parties interested of £74—0--10 refunded by the Furness Bermuda Line on account of damage caused to green vegetables on S. S. Fort Victoria which left Bermuda on 17th May, 1924.

Canada.—The exports of onions to Canada during the last ten years were as follows:

	Bushels.	Percentage of entire crop.
1916	2,985	2
1917	10,892	8
1918	21,879	16
1919	12,976	9
1920	8,549	8
1921	*12,544	25
1922	21,323	30
1923	5,875	17
1924	23,194	55
1925	10,248	51

*From Customs returns.

Canada is of interest to the Bermuda farmer chiefly because it is a potential onion market capable of development. Though the price of onions in Canadian cities is influenced by the price in New York, Bermuda onions can be marketed much more cheaply in Canada than in the States, as shown by the following table giving the costs of marketing a crate selling at $3.00.

	Canada	United States.
Shed tax	1 cent	1 cent.
Ocean freight	14 "	14 "
Import duty	free	abt. 50 "
Cartage	nil	10 "
Commission	abt. 15 "	30 "
	30 "	1.05 "

To develop the Candian market, The Shipment of Produce to Canada Act, 1923, was enacted. This measure deals only with onions, and came into operation on 1st January, 1925. The following remarks are made with respect to its working during its initial season. Seven licenses were granted, and in no case was a license refused. No licensed shipper was required to submit for the information of the Board any papers relating to sales. One receiver was approved. The committee appointed to regulate the quantities of onions shipped was not called together. No notifications were received from farmers of intention to ship, and farmers generally appeared to be quite indifferent to the operations of the Act. Only after the experience of several years of normal production and prices can the benefits, or otherwise, of the Act be appreciated.

West Indies.—Exports to the West Indies during the last ten years have been as follows:

	Onions		Potatoes.	
1916	10,258	bushels	287	barrels
1817	18,291	"	3,655	"
1918	19,488	"	10,832	"
1919	5,578	"	4,173	"
1920	19,208	"	142	"
1921	*14,455	"	4,830	"
1922	12,080	"	1,652	"
1923	8,517	"	123	"
1924	6,524	"	1,212	"
1925	1,622	"	1,945	"

*From Customs returns.

The West Indies are of value chiefly as an outlet for onions and potatoes in season of low prices in New York, and for the same vegetables of a grade not acceptable in northern markets. No systematic attempt has been made to develop our export trade to these Islands which may prove to be of greater worth than they are now considered to be.

POTATOES.

The exports of potatoes during the last ten years were as follows.*

1916	59,987	barrels
1917	75,632	"
1918	81,158	"
1919	87,096	"
1920	58,674	"
1921	58,955	"
1922	41,999	"
1923	33,604	"
1924	35,254	"
1925	23,488	"

*The above quanities are for the seasons December to June, except those for 1921 which are for the calendar year, and from Customs returns.

The quantity shipped in 1925 was 66 per cent of that of the previous year, and 40 per cent of the median of the last ten years. Several causes contributed to reduce the Triumph crop; the quantity of seed imported was much below the average, and nearly one half (44 per cent) was badly infested with leaf-roll, weather conditions were not favourable, for on 11th, 12th and 13th November the wind was very high and the consequent damage to potatoes was very severe, and late blight was generally prevalent in the late planted Triumphs. Poor seed was the popular explanation of the small crop, and in this connection some comparisons of yield obtaind at the Station are of peculiar interest. The first planting was made on 29th September, and the second on 24th October; the one was severely injured by wind, the second was not. In both plantings seed with little leaf-roll infestation and seed with heavy infestation were included. The average yields were as follows:

	Yields per rod	
	Good Seed	Bad Seed
Early planting, injured by wind	17 pounds	13 pounds
Late planting, not injured by wind	71 "	51 "

The above figures indicate that in the first case (that of early planting) much greater loss was occasioned by wind injury than by bad seed, and the date of this early planting synchronised with the time of planting the main crop throughout the Colony. Further, the late planted seed on farms was chiefly New Brunswicker which contained only 2.5 per cent leaf-roll. Many of the fields planted to this strain were so seriously injured by late blight that the yields were neglible. This seed planted at the Station yielded nearly 72lbs. per rod. and equal yields should have been obtained on most farms if blight had been controlled by dusting or spraying.

The quality of the Garnet seed from Nova Scotia was satisfactory, and yields were reduced by excessively heavy rains soon after planting and drought later. In the cases coming under observation the Garnet seed from New Brunswick did not crop as well as did the Nova Scotian.

Reference was made in last year's report to the prizes offered by the Board for potato yields. Very little interest was taken in the competition, and seven entries were received for Triumph plots, and none for Garnet plots. As noted in last year's report, liberal donations for prizes were made by the Furness Bermuda Line, the Royal Mail Steam Packet Co., and Messrs. R. Darrell and Co., and the lack of interest shown by farmers was the more regrettable.

Field inspection of seed was conducted by the Director who for this purpose visited Mattituck, Long Island, N. Y., Belmont, N. Y., and Caribou, Me. A full report of the inspection was presented at the time, and the subject will be here briefly referred to.

The seed on Long Island had been purchased from Amos Radcliffe, Eagle River, Wis. At the time of inspection leaf-roll was not apparent in the Long Island fields, but the infestation in Bermuda was as high as 30 per cent in some cases.

Seed grown at Belmont, N. Y., was inspected at the request of Messrs. R. Darrell & Co., Hamilton. The percentages of leaf-roll in the accepted fields averaged .86% and the spread in Bermuda was very slight.

As a result of the visit to Caribou, Maine, Dr. H. C. Sands will this year (1926) plant a small quantity of Triumphs to supply Long Island.

Through the courtesy of Dr. W. A. Orton of the Federal Horticultural Board, Washington, information was received from the Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y., relative to the artificial hastening of the germination of seed potatoes. At the close of the year the information furnished and the generous assistance offered by Dr. William Crocker and Dr. F. E. Denny, which appeared to be full of promise, was under consideration.

GREEN VEGETABLES.

Exports of green vegetables during the last ten years were as follows:

1916	252,333	bushels
1917	209,894	"
1918	63,976	"
1919	162,517	"
1920	260,784	"
1921	263,649	"
1922	191,806	"
1923	193,974	"
1924	280,745	"
1925	216,891	"

The quantity exported in 1925 was 77 per cent of the quantity exported in 1924, and 103 per cent of the yearly exports in the last decade. The causes for this falling off in the crop of 1925 compared with that of 1924 were low prices in New York, and the small crop of celery due to the ravages of the Septoria blight and dry weather shortly before harvest. This vegetable was 61 per cent of the previous year's crop and 98 per cent of the last five years' average.

The vegetables exported formed the following percentage of the whole:

Carrots	29	per cent
Parsley	26	" "
Celery	19	" "
Kale	12	" "
Beets	8	" "
Lettuce	2	" "
Beans, fava	1.5	" "
Tomatoes	.5	" "
Other vegetables	.2	" "

ONIONS.

Exports of onions for the past ten years have been as follows:

1916	148,221	bushels
1917	132,358	"
1918	133,141	"
1919	131,271	"
1920	109,072	"
1921	*49,455	"
1922	70,874	"
1923	35,176	"
1924	41,848	"
1925	21,170	"

*From Customs returns.

The quantity exported in 1925 was 50 per cent of the quantity exported in 1924, 21 per cent of the median for the last ten years, and with respect to the median annual exports of the decades ending 1920, 1910, 1900 and 1890 was 16, 8, 7 and 9 per cent respectively.

Insufficient seed was the chief factor in reducing the 1925 crop which was a fair one in yield. The bulbs were clean and bright and sold at remunerative prices in Canada and the United States. Except in seasons of high prices, as in the year under report, Bermuda-grown onions cannot be sold with profit in the United States, and it is only by the development of an adequate market in Canada that the cultivation of onions can be re-established.

Much attention has been given to the importation of seed that will produce extra early maturing bulbs, and enquiries are being continued with respect to Calfornia as a source of supply.

BERMUDA EASTER LILIES.

Exports of Bermuda Easter lily bulbs **(Lilium Harrisii)** for the last ten years have been as follows:

1916	1,224	cases
1917	1,009	"
1918	823	"
1919	664	"
1920	749	"
1921	936	"
1922	1,604	"
1923	3,116	"
1924	3,539	"
1925	4,040	"

The steady growth in recent years is highly satisfactory, as is the fact that though the quantity exported in 1925 was but little more than half the quantity exported in 1900, when the trade was at its height, the declared values were approximately the same.

A meeting of lily growers was called in March to discuss the future development of lily growing. Field inspection and certification was the chief feature discussed, and it was unanimously

agreed that this service should be put into effect in 1926. Shortly after the meeting, however, the apppearance of disease in a few fields caused the Board to decide on immediate field inspection. It was admitted at the time that the work was begun too late to give complete satisfaction, but, despite opinions to the contrary, it is evident that the service was of benefit to the majority of the growers. Plans were under consideration at the close of the year which should greatly improve the service in 1926.

To advertise lily bulbs in Great Britain, 3.000 selected bulbs were purchased with the assistance of the Trade Development Board, and sent to the Bermuda Pavilion at the British Empire Exhibition for distribution, which was very effectively done by the Deputy Commissioner, Capt. F. C. Misick, M.C.P., who brought back with him the correspondence received from those to whom bulbs were sent, and to whom it is now proposed to send follow-up letters.

A short illustrated article sent to the Gardener's Chronicle (London) by the Director resulted in a small number of enquiries being received from Australia, New Zealand, India and other parts of the Empire. To all enquirers sample bulbs were sent.

The stock of bulbs now under cultivation is the best yet grown in Bermuda, further, the nature and control of diseases and pests is better understood, and if the advice of the Plant Pathologist is faithfully followed, and the marketing end equally well cared for, lily growing in Bermuda should eventually be one of our most valuable agricultural assets.

THE HOME MARKET

Diminishing agricultural exports direct attention to the market at home.

The permanent population of the Colony is 20,127 (1921 census) and the number of tourists visiting Bermuda annually during the last five years was 24,312. To feed this permanent and transient population it is estimated that about 7,000 tons of food are imported and about 3,000 tons produced locally, exclusive of fish. The disparity between the two quantities named could be reduced with profit to consumer and producer.

Speaking first of vegetables, it is probable that Bermudians eat more vegetables and in greater variety than are eaten at home, but from the standpoints of both health and economy vegetables should be eaten in larger quantity than they now are. In this connection the following quotation from W. Robinson's "The Vegetable Garden" is of interest. "The reason why the more delicate vegetable foods are neglected is because the cooks of Europe have served an apprenticeship of a thousand years on the carcases of ox, pig, sheep, and we are meat eaters because our fathers had little else to eat..... A few generations only have passed since our now commonest vegetables came from the Continent. We are adding to their number every day, and by

the aid of cultivation we are winning our way to a simpler, healthier food."

Beginning in the farm home, where imported food stuffs are now eaten in smaller proportion than in the other homes of the Colony, a determined effort should here be made to produce a very large part of the family's food, not alone vegetables, but milk, eggs, meat of various kinds, fruit and honey. The home gardener could with advantage return to his War-time gardening activity; as an exercise gardening is at least the equal of golf, and in addition there are the vegetables. Those who cannot garden because of lack of gardens should purchase home-grown vegetables more freely. Close neighbourhood co-operation between householders and farmers is recommended.

To the hotels the farmers naturally expect to sell a very large part of their produce. The quantity so sold is steadily increasing, and will increase more rapidly when some form of contract is entered into between hotels and farmers. Such a course apppears essential if the constant supply of vegetables is to be produced without unnecessary waste.

The prohibitive import duty of ten shillings per bunch on bananas should increase the production of this valuable fruit, at present estimated to be 650 tons annually. Consumption will not reach its maximum until the spread between the price paid to the grower and that charged the consumer is lessened. Last summer farmers were paid 1½ pence and 2 pence per pound and the consumers were charged 4 pence and 5 pence.

It is estimated that there are in the Colony 1,000 milch cows, the annual production of which is 1,460,000 quarts, worth £60,833 at ten pence per quart. The food value of milk cannot be overestimated, but Bermudians are not milk eaters. Dietitians recommend a daily consumption of one quart for a child and one pint for an adult. On this basis 4,800,000 quarts would be required annually for our permanent population alone, and at the present time only 30 per cent of that quantity is produced.

The General Board of Health and the Director of Medical and Health Department are congratulated on the improved sanitary condition of dairies; and the enforcement of their regulations, if not made a burden to the producer, should encourage milk production. Much could be done by the Dairy Cattle Club to assist cattle owners in improved methods of breeding and feeding, and to increase the supply of and demand for milk.

The number of hens in the Colony is estimated to be 28,000 which at 6¼ dozen each would produce 175,000 dozen eggs worth £26,250 at 3/- per dozen. The local production of eggs can be greatly increased. The circumstances which now operate against the industry are of such nature that they can be removed or corrected.

The local production of pork could be profitably increased by greater attention to the principles of breeding and feeding, and

the cultivation of summer forage crops. Of minor importance as food producing animals are goats and rabbits which, with bees, are deserving of some attention.

The subject of fruit growing is placed last because it is felt that until the Department has further advanced in the experiments now in hand in relation to the control of certain serious fruit pests, it would be idle to suggest general fruit growing.

FARMERS' MARKET.

The Farmers' Market has not attracted more vendors, but those who sell in it are increasing the quantity and variety of their produce. On a Saturday morning just before Christmas the following were on sale: Bananas, beans, beets, cabbage, Chinese cabbage, carrots, cassava, chard, christophine, colewort, cucumbers, eddoes, egg-plant, eggs, endive, kale, kohl rabi, leeks, lettuce, mustards, onions, papaws, parsley, peas, peppers, Irish and sweet potatoes, poultry, pumpkins, radishes, ruta baga, sage, squash, spinach, thyme, tomatoes and turnips. The average number of buyers was one hundred and forty.

To encourage sales in the Market the board offered small weekly prizes to the vendors, and the competition for these prizes was quite keen. Rules governing the Market were amended during the year under report.

One very important benefit which has followed the opening of the Market has been the increased general demand for local-grown farm produce.

FARM LIVE STOCK.

Dairy Cattle.—At the Annual Agricultural Exhibition, 1925, great improvement was to be observed in the quality of the dairy animals exhibited, the majority of which were Bermuda-bred. Pure bred bulls and high grade heifers are being dispersed from the Guernsey herds of Mr. B. C. C. Outerbridge, M.C.P., Smiths, and Wor. J. Scott Pearman, J.P., M.C.P., Smiths, as well as from the Station herd. These herds are very small, but are doing much to improve local dairy cattle.

The Bermuda Dairy Cattle Club was organized at the close of 1924, and was active at the Exhibition in 1925. There is much that such a society can do for dairying in Bermuda.

Pigs.—Messrs. Hollis Bros., Crawl, showed at the Agricultural Exhibition a fine boar purchased from Highwood Farm, Dundee. N.Y., and this animal, as well as the more recent importations by the Department from the same source, and from Nova Scotia by Mr. W. A. H. Barnes, Southampton, should go far to benefit this class of farm live stock.

Goats.—Progeny of the Department's Toggenburg buck are now beginning to apppear, and some improvement in the poor man's cow, of real value in the Colony, should soon be evident.

Poultry.—Poultry still continues to receive the attention of the Poultry and Pet Stock Association. The annual show of the

society was held at the Agricultural Station on 28th and 29th January, and marked improvement in the birds exhibited was evident even to the most inexperienced observer.

The First Agricultural Assistant, who was the very active Honorary Secretary-Treasurer of the Association for many years, has rendered assistance to many breeders by culling their flocks, and giving advice on breeding and other features of poultry culture.

The small lot of breeding stock shipped to the West Indies during the year, if of the right quality should be the means of developing a profitable export trade to the West Indies.

SOIL IMPROVEMENT BY GREEN MANURING.

All tests and observations made at the Station further establish the value of (1) heavy applications of farmyard manure, (2) leguminous green manure in conjunction with light applications of farmyard manure, and (3) moderate use of artificial fertilisers in conjunction with either of the two manures previously named.

Cultivators of the soil in Bermuda must recognise that here soil exhaustion is relatively rapid because of (1) abundant sunlight, (2) absence of winter's snow, (3) adequate rainfall, and (4) nature of the soil. For these reasons it is necessary to give constant thought to the renovation of the soil.

As few, if any, farmers have at their disposal sufficient farmyard manure to make liberal annual application to all fields, the cultivation of leguminous green manure crops should be recognised as an essential feature of farm practice. Green manure cropping should further commend itself to Bermuda farmers because it does not interfere with the growing of cash crops. At the Station it has been found possible to grow two crops of potatoes and a crop of corn as well as a green manure crop within a year. The most benefit is obtained from green manure when a light dressing of barnyard manure is added. Humus and nitrogen are contributed by the green manure and the chief function of the barnyard manure is to increase the bacterial flora of the soil.

The declared import values of commercial fertilisers, chiefly castor meal or pomace, imported into the Colony during the ten years 1915 to 1924 were as follows:

1915	£7,177
1916	10,345
1917	18,303
1918	8,357
1919	13,159
1920	19,262
1921	10,194
1922	7,332
1923	9,423
1924	11,951

The average of these years is £11,550 to which at least 20 per cent should be added to arrive at the selling price, thus making the farmers' annual fertiliser bill £13.860. Full benefit from this expenditure cannot be secured, in the majority of cases, except by the use of green manures.

Several leguminous green manure crops have been tested at the Station, and cowpeas and soy beans have to date proved the most sutiable. Cowpeas possess two advantages over soy beans. namely, the attendant bacterium is present in most soils, and heavier crops generally secured. The soy bean, on the other hand, possesses the following advantages, the seed is cheaper, the plant is of erect growth and is thus more easily handled, it is more resistant to drought, and is far more readily eaten by all kinds of farm stock. When used as fodder 80 per cent of its manurial value may be returned to the soil.

The soy bean is the most valuable agricultural plant recently introduced into Bermuda. In addition to its high value as a soil renovator, it is an excellent fodder crop. The following figures are from W. A. Henry:

	Digestible nutrients in 100 lbs.		
	Crude protein	Carbo-hydrates	Fat
Soy bean, dried seed	29.1	23.3	14.6
Wheat bran	11.9	42.0	2.5
Soy bean, hay	10.6	40.9	1.2
Timothy hay	2.8	42.4	1.3

Soy beans possess a third use, namely, as a green table bean. Though difficult to shell, their flavour is most excellent.

In conclusion, the benefits which follow leguminous green manuring are briefly set down: (1) Addition of humus, (2) addition of nitrogen, (3) conservation of plant-food, (4) concentration of plant-food, (5) improvement of physical condition of soil, (6) control of weeds, (7) saving of labour and (8) more effective use of ferterlisers.

FARM LABOUR

Little relief was felt in the shortage of farm labour during the busy months, nor is it to be anticipated that low-priced labour in abundance will be again obtainable in Bermuda; time is lost that is spent in wishing old days back. Labour conditions on the farm are not to be ameliorated by cheap man power, but by some of the following methods, (1) use of efficient tools and implements, (2) improvement of farm methods, (3) increased use of horse labour, (4) better housing conditions in rural districts, and (5) profit sharing with sons and employees.

Owing to agricultural depression many farm labourers were temporarily short of work during the slack summer months,

and the Department undertook to operate a very modest labour exchange which resulted in finding work for some.

CONTROL OF PLANT DISEASES AND PESTS.

The Plant Pathologist's report is evidence of the manner in which the Department is serving the farmers of the Colony by studying and disseminating information regarding local plant diseases and pests and control measures.

It has been estimated that fifty per cent of our crops are lost annually by the depredations of diseases and pests. Whether this estimate is approximately correct or not is of no importance, for the loss is so great that exactness in expressing it is uncalled for.

The use of Bordeaux mixture to control fungoid diseases of plants, especially potato blight (**Phytophthora infestans**), was first explained to Bermuda farmers about 1893 by the late Wilfred Field, and though many thousands of pounds were saved to the Colony by the information gratuitously given by Mr. Field, he was permitted to die in the Poor Asylum. Control still aimed chiefly at potato blight, was further stimulated by the former Director of Agriculture, Mr. E. J. Wortley. In 1921 the preent Director, alive to the value of more general control of pests and diseases, was fortunate in securing for a year the association with the Department of Prof. H. H. Whetzel of Cornell University. Professor Whetzel, because of his complete knowledge of the subject and long experience in dealing with farmers, did more to instruct Bermuda farmers how to fight the eninies of their crops than had been acomplished by all who had preceded him. The more modern weapon of attack, fungicide and insecticide dust, was introduced into Bermuda by Professor Whetzel. It is not necessary here to make comparison of the relative merits of the two methods, for both are equally affective, if applied with brains, but the newer method possesses advantages to the Bermuda farmer, and is likely to supercede spraying within a short time. Professer Whetzel also made use of a yet more scientific method of control of insects, that of using the natural enimies of the pests, and future relief from many of our plants' insect foes will probably be found in this method. Already signal success has followed the introduction of **Aphelinus diaspidis** a parasite of the oleander scale (**Aulacaspis pentagona**).

The association with the Department of this noted American plant pathologist showed to all who took an intelligent interest in the subject of plant disease and pest control the necessity of a permanent appointment of a plant pathologist, and for the last twenty-seven months the work so ably begun by Professor Whetzel has been successfully carried on by Mr. L. Ogilvie, Plant Pathologist of the Department. Mr. Ogilvie is highly trained, and has applied himself very closely to the many problems which have presented themselves, and has thus made himself quite familiar with local conditions. During his recent visit to the Colony Professor Whetzel expressed himself in the following words::

> "Bermuda has made remarkable progress during the past four years along this line. The importance of

controlling the insect pests and diseases of their crops has been brought continuously to the attention of your farmers. Most of them now recognise and admit the desirability of such control, even if they do not practice approved and effective methods as generally as is to be desired. This progress is the solution of the problem."

The Department's present duty is to convince the farmers of the Colony of the relative ease with which they can control the foes of their crops by the modern methods which science has placed at their command.

INSPECTION SERVICES.

The inspection services of the Department are numerous, and during the year under report the duties relating thereto were increased by Regulations under The Shipment of Produce to Canada Act, and field inspection of lilies. These services relate to the following:

(1) Contagious Animal Diseases. All imported live stock is subject to inspection at the dock, and to such treatment that the Government Veterinary Officer shall deem necessary. Contagious animal diseases are controlled by quarantine or other treatment, and the Government Veterinary Officer is to be congratulated on another year's freedom from serious outbreaks. In the control of bovine tuberculosis ten animals were slaughtered. The Veterinarian's report gives further particulars on the subject.

(2) Produce Exported. The good quality of the vegetables exported is maintained by inspection immediately previous to shipment. Particulars of the service, which was satisfactorily performed by the Inspector of Produce and staff, will be found in the Inspector's report.

(3) Shipment of Produce to Canada. The administration of The Shipment of Produce to Canada Act (No. 17 of 1923) is by Regulations which came into effect on 1st January, 1925. Information on the subject may be found under "Marketing Notes."

(4) Easter Lily Bulbs and other Nursery Stock Exported. In conformity to our own Regulations as well as to the ordinances of the importing countries, particularly those of Great Britain, the Dominion of Canada and the United States of America, all nursery stock intended for export, which consists almost entirely of bulbs of the Bermuda Easter lily (**L. Harrisii**), is inspected chiefly by the Inspector of Produce. To give additional assistance to growers who are endeavouring to improve their stocks, fields inspection was begun during the year under report. Fuller reference is made to the subject under "Bermuda Easter Lily Bulbs" and in the report of the Plant Pathologist, by whom the service of field inspection was performed.

(5) Seed Potatoes Imported. In addition to the field inspection referred to under "Potatoes", a further inspection takes place at the dock with respect to scab, rot, other diseases and pests,

size type of tubers, and admixture of foreign varieties. The service is performed by the Inspector of Produce. Permits to import seed potatoes are obtainable from the Board, and the Inspector issues certificates for attachment to Customs entries.

(6) **Vegetable Seeds Imported.** Samples of vegetable seeds to the number of 108 were inspected for viability and suitability to local requirements, and the majority were found to be satisfactory. Under the provisions of the Act (No. 65 of 1921) the following seedsmen were registered: Bermuda Green Vegetable Growers' Association, H. G. Hill & Co., O. R. Loblein, E. S. Outerbridge, E. Worrall Outerbridge, Co., Theodore Outerbridge, J. H. P. Patterson, A. J. Saintes, Thos. J. Wadson & Son, and B. W. Walker & Co. Examination of seed, particularly that of celery by the Plant Pathologist, should prevent the future importation of such seed effected with celery blight **(Septoria)** a matter of great importance to our celery growers.

(7) **Nursery Stock, Bananas and Citrus.** To intercept dangerous plant diseases and pests, imported bananas, citrus fruits, nursery stock and all living plants are subject to inspection on arrival. The service is performed by the Plant Pathologist. Fear has been expressed in some quarters that by permitting the importation of bananas from the West Indies, Panama disease **(Fusarium cubense)** may be introduced into the Colony to the great injury of the local production of the Canary bananas **(M. Cavendishii)**, but all evidence secured by the Department is to the contrary.

(8) **Local Plant Diseases and Pests.** Regulatory control has been continued with respect to **Comstockiella sabalis** on the native palm **(Sabal Blackburnianum)**. This pest, so far as the Department is aware, is still confined to St. Georges Parish though infection has spread within that parish. The subject is treated by the Plant Pathologist.

Investigations by the Pathologist resulted in the determination of the fava bean as an host plant of the Mediterranean fruit fly **(Ceratitis capitata)**, and the further importation of that vegetable into the United States of America has been, unfortunately, prohibited by the Federal Horticultural Board. Relief from this pest is anticipated by means described by the Pathologist.

The two motor pumps have been employed irregularly in spraying fruit and other trees and cash crops. A fee of twenty shillings per day is charged when in use in cash crops.

Contributions of £50 each to the Bureau of Mycology and Bureau of Entomology were made by the Colony, and the valuable assistance rendered this Department by both Bureaus is gratefully acknowledged.

Conditions under which Plants and the Parts Thereof may be Imported. All living plants and parts thereof intended for planting (except seeds), bananas, and citrus fruits, are subject to inspection at the dock or Post Office according to the manner of importation. No permits to import are required, except seed potatoes, see (4).

Prohibited Plants. The following plants and parts thereof are prohibited entry into the Colony:

(a) Banana plants and parts thereof, except the fruit.
(b) Bulbs of Lilium longiflorum type.
(c) Antirrhinum or snapdragon plants.
(d) Citrus plants and citrus fruits, unless free from leaves, twigs and other portions of the plant, from the West Indies and Bahamas.
(e) Sweet potatoes for the United States of America, Cuba, Bahamas, British Guiana, Jamaica, Canal Zone and Porto Rico.

ANNUAL AGRICULTURAL EXHIBITION

The Annual Agricultural Exhibition continues to grow in value and interest. It is not alone an aid to agriculture, but to nearly every other industry in the Colony, and is in every sense a community effort. No other annual event receives like popular support, and the Department is deeply indebted to all who by their whole-hearted assistance make the Exhibition the biggest yearly feature in Bermuda. That it absorbs much of the Department's energy for a few weeks each year is not denied, but in each succeeding year better organization and improved facilities make easier the task of management, and the results fully justify the time and attention given to the Exhibition.

In 1925 the Exhibition was held on 22nd, 23rd and 24th April. Weather conditions were fair, and the attendance nearly reached the unprecedented attendance of the previous year, 12,000. The premium list included, as before, live stock, vegetables, fruits, flowers and plants, home-made food products, and arts and crafts. As will be seen, the total number of entries was larger than ever before, but the increase was entirely in the non-agricultural classes. The reduction in live stock, vegetables and other farm exhibits was largely due to the depressed condition of local agriculture at the time of the show, and the reduced number of flower exhibits may be attributed to the over-crowded condition of the flower tents in 1924. The quality of the exhibits, as a whole, continues to improve, and in 1925 this was specially true of dairy cattle and poultry.

As stated in last year's report, the Exhibition long ago outgrew in every particular the facilities provided for it. Only one class of exhibits, namely, poultry, is shown satisfactorily, and already it promises to over-flow its building. The stone building erected by the Works Department during the year under report gives relief, but many other buildings and improvements are needed.

COMPARISON OF 1924 AND 1925 EXHIBITONS

Number of Entries.	1924	1925
Horses	134	97
Cattle	94	74
Pigs	—	10

Goats	28	31
Rabbits	36	31
Poultry	293	233
Dogs	101	67
Vegetables	502	483
Fruits	56	29
Flowers and Plants	833	589
Food Products	553	818
Arts and Crafts	800	1261
Totals	3433	3723
Number of prizes awarded,		
to adults	911	850
to clubs	550	669
Estimated attendance	12000	nearly 12000

Financial Statements, 1924 and 1925.

RECEIPTS.

	1924	1925
Balance brought forward	£120 13 11	£ 2 8
Granted by Appropriation Acts	300 0 0	400 0 0
Donated by Trade Development Board	37 18 8	18 19 4
Donated by sundry persons for prizes	42 0 0	22 16 0
Gross receipts for catalogue and other advertisements	122 9 6	122 16 6
Ground rents	48 0 0	72 10 0
Entry fees	44 4 0	34 2 0
Poultry Association and Kennel Club	8 8 9	— — —
Gate receipts	360 12 6	323 18 6
Enclosure receipts	107 16 4	64 6 10
Unpaid adult prize money	10 6 0	4 16 6
Sundry	1 0 0	3 7 11
	£1203 9 8	£1067 16 3

EXPENDITURE.

Prizes for adults	374 12 0	369 16 0
Prizes to Agricultural Clubs	83 12 6	113 13 0
Prizes for sports	38 13 2	5 16 2
Catalogues, etc., printing and commission on advertisements	89 14 9	111 11 0
Advertising	37 0 0	21 4 0
Stationery and printing	52 0 9	47 7 2
Poultry coops and benches	182 15 9	— — —
Lumber	62 0 11	13 11 2
Other material	20 8 8	47 13 5
Bands	50 0 0	50 0 0
Carriage and teas for bands and others	21 10 0	20 10 0
Carriage of exhibits	7 0 0	9 4 0
Labour, field, including overtime	42 4 1	43 8 1
Watchmen	7 10 0	3 0 0
Gate-keepers	30 15 0	28 10 0
Office	27 9 3	30 6 0
Police	2 0 0	3 0 0
Cartage	28 12 6	12 19 6
Depreciation, rental, etc. of Government Stores	26 16 10	16 15 3
Light, telephone and miscellaneous	9 10 10	41 15 6
Balance	2 8	77 16 0
	£1203 9 8	£1067 16 3

Donors and Winners of Special (Adult) Prizes

Mrs. F. B. Tompkins, two pounds and one pound respectively for best two trolly horses, worked by owners, competition restricted to truckmen

who own not more than three horses each: 1. Mr. H. Bean Wilson, Pembroke; 2. Mr. Fred Smith, Pembroke.

National (American) Single Comb White Leghorn Club, ribbons for best cock, hen, cockerel, pullet and pen: Mr. P. C. Hammond, Pembroke.

His Excellency the Governor, silver presentation cup for highest points won by a farmer for exhibits of vegetables: Mr. T. A. Douglas, Pembroke.

J. Roosevelt-Roosevelt, Esq., five pounds for best collection of vegetables shown by a farmer: Mr. Antone Garcia, Smiths.

Bermuda Garden Club, two pounds for best shrub or vine novelty: Miss Edith Allen, Smiths

Messrs. Sutton & Sons, England, silver challenge bowl for best collection of vegetables and flowers (six of each) grown from firm's seeds: Mr. T. A. Douglas, Pembroke.

Messrs. James Carter & Co., silver challenge cup for best collection of vegetables and flowers (six of each) grown from firm's seeds: Mrs. Harry Spicer, Pembroke.

Bermuda Green Vegetables Growers' Association, five shillings respectively for best brown hen eggs and best white hen eggs: Mrs. W. R. Evans, Pembroke, and Miss Amy Doe, Paget.

Mr. S. A. Paschal, five shilllings for best duck eggs: Mrs. H. H. Hallett, Pembroke.

Special prizes won by members of Boys' and Girls' Agricultural Clubs are given in the following section.

BOYS' AND GIRLS' AGRICULTURAL CLUBS.

Agricultural Clubs exist in connection with nearly all the schools in the Colony. Their primary object is "to interest the members in the land, the cultivation of plants, and the care of animals, and the girls in home making." At least two visits yearly are , as a rule, paid to each Club when the members are instructed in vegetable and corn growing and in preparing exhibits for the Annual Agricultural Exhibition. About 1,500 packets of seeds were issued to members.

Agricultural Club work is not altogether satisfactory in some respects, yet were it discontinued a distinct loss would be suffered by the children and young people of the Colony. Of that there should be no difference of opinion. The obligation of the Department to Major S. C. Hicks for his supervision of the Clubs during a part of the year under report is here acknowledged, and regret is expressed that his valuable services are suspended by his temporary absence from Bermuda.

The interest taken by the majority of the Clubs in the Annual Agricultural Exhibition and the keenness of the competition are very gratifying. Less pleasing, however, is the lack of interest taken recently in corn growing, but some of the disabilities which the competitors have suffered will shortly be removed.

At the Annual Agricultural Exhibition no less than 2,314 entries were received from Club members, an increase of 67 per cent. over the previous year's excellent record. Improvement in the quality of the exhibits was observable in most classes.

A comparison of the number of Club entries for the last two years follows:

Sub-Class	1924	1925
Horses	4	2
Cattle	5	5
Goats	22	29
Rabbits	30	18
Poultry	37	60
Dogs	25	15
Vegetables	264	304
Fruits	30	12
Flowers and Plants	194	280
Food Products	278	562
Arts and Crafts	666	1017

The interest of Club members was greatly stimulated by the generous prizes offered by many interested. The names of the donors and winners of the prizes follow:

His Excellency the Governor, two silver presentation cups for highest points for exhibits of vegetables and of flowers: Harry Garcia, Whitney Institute, and Mabel Dunkley, Bermuda High School for Girls.

His Honour Sir Kenneth Beatty, one guinea for best collection of vegetables, Harry Garcia.

Honble. John Trimingham, one pound each for highest points for vegetables won respectively by boy and girl: Harry Garcia and Catherine Smithers, Bermuda High School for Girls.

Mrs. James A. Conyers, ten shillings each for best plain sewing by girl ten to twelve and by girl under twelve years old: Audrey Gibbons, Mount St. Agnes Academy, and Jessie Murphie, Woodlands School.

Mrs. Edith York, ten shillings each for best exhibits, made respectively by boy and girl, selected for display at Wembley: Leonard Gibbons Whitney Institute, and Florence Johnson, Warwick Academy.

Honble. J. P. Hand, M.B.E., M.C.P., five shillings to each boy or girl who won the greatest number of prizes is his or her respective Club: These prizes were won by thirty-one contestants.

Bermuda Rotary Club, bronze challenge shield for highest collective points won by members of any Club: Bermuda High School for Girls Club.

As intimated, the interest in the year's corn contests was not satisfactorily maintained. Only 31 ten-ear exhibits were sent in, and there were 6 entries in yield contest. The silver challenge cups were won by the following members:

Silver Challenge Cup donated by the Bermuda Green Vegetable Growers' Association for best ten-ear exhibit grown by a boy: Brian Smith, St. Georges Grammar School.

Silver Challenge Cup donated by Honble. W. E. Jackson, C.M.G., for best ten-ear exhibit grown by a girl: Gladys Paris, Warwick Academy.

Silver Challenge Cup donated by Honble. J. P. Hand, M.B. E., M.C.P., for highest yield: Almeda Cowen, Mount St. Agnes Academy.

In addition to the cups, cash prizes to the value of £6-12-0 were awarded to twenty-nine competitors representing fourteen Clubs.

VISITS TO FARMS, ETC.

More than one thousand recorded visits were paid to farms and gardens by members of the Department, as is shown in the following table. It is recognised that very close contact should be maintained with farmers, and that it can best be maintained by meeting them on their farms. Farmers are met also at the dock during the shipping season, at the Annual Agricultural Exhibition, which is visited by a large number, and at the Annual Somerset Flower Show where the Department conducts a demonstration booth.

Visits Paid

Parish.	Director.	Pathologist.	Assistant.	G.V.O.	Inspector.	Totals
St. Georges	31	74	—	—	—	105
Hamilton	6	24	17	4	5	56
Smiths	24	60	27	23	7	141
Devonshire	23	67	26	3	16	135
Pembroke	2	30	59	45	13	149
Paget	46	118	5	13	11	193
Warwick	23	44	28	3	19	117
Southampton	28	35	15	1	21	100
Sandys	7	51	17	1	—	76
Totals	190	503	194	93	92	1027

DIRECTOR'S VISITS TO UNITED STATES

In May and again in June and July the Director was in the United States of America on duty. Both visits were reported fully to the Board, and a brief summary is now presented for purpose of record.

(1) **Detention of Celery by Bureau of Chemistry.** In May the Director, accompanied by Mr. A. J. Gorham, the Board's representative, proceeded to New York to enquire into the circumstance of Bermuda celery detained by the Bureau of Chemistry, United States Department of Agriculture. It was found on enquiry that the attention of the Bureau had been directed to Bermuda celery by the presence of arsenical poison in celery received in New York from another locality, and the Bureau was soon satisfied that our celery was not a source of danger to the consumers. Appreciation is expressed of the courtesy extended by Dr. H. W. Redfield, Chief of the Bureau and his staff, and of the assistance afforded by Prof. H. H. Whetzel and Dr. L. M. Massey of Cornell University.

(2) **Visit to Long Island.** Mattituck, Long Island, was visited to make preliminary inspection of and enquiry regarding Triumph seed being grown on Long Island for Bermuda.

(3) **Visit to New Jersey.** A short visit was paid to Ridgewood, N. J., as the guest of Mr. F. E. Tether, a prominent celery grower who markets his crop direct, and who on a recent visit to Bermuda had addressed celery growers and shippers on mar-

keting methods. At this time the subject was further discussed, and the following recommendations were made by Mr. Tether:

(a) More direct methods of sale.

(b) Concentration of New York sales.

(c) Development of additional markets.

(d) Selection of better strains of seeds.

(4)..**Market Enquiries.** Attention was also given to market conditions with respect to celery and other crops, comment on which is not now called for.

In June the Director left Bermuda for a second visit to the United States, and then gave attention to the following matters:

(1) **Inspection of Seed Potatoes in Long Island and Belmont, N. Y., and Caribou, Me.** This is dealt with under "Potatoes."

(2) **Visit to Washington, D. C.** Dr. C. L. Marlatt, Chairman of the Federal Horticultural Board, was interviewed with reference, chiefly, to the control of the Mediterranean fruit fly.

Dr. A. L. Quaintance, Acting Chairman of the Bureau of Entomology, was also interviewed, and information was obtained regarding the natural enemies of certain insect pests of plants.

A visit was paid to the retail produce market, and buildings of the type there seen are recommended for Bermuda.

(3) **Visits to Ithaca**... When in west New York to inspect the seed potatoes at Belmont, Prof. H. H. Whetzel was visited at Cornell University, Ithaca. Among other matters his proposed visit to Bermuda in the winter of 1926 was discussed.

(4) **New Bushel Crate.** Arrangements were made to have samples submitted of the long-discussed new crate.

PUBLICATIONS RECEIVED

The Department gratefully acknowledges the publications received from the British Ministry of Agriculture and Fisheries, the Department of Land and Agriculture, Dublin, the Canadian (Dominion) Department of Agriculture, the Ontario Department of Agriculture, the Imperial Department of Agriculture for the West Indies and other agricultural departments of other parts of the Empire, from the United States Department of Agriculture and many of the State Colleges of Agriculture and Experiment Stations, and from agricultural departments of other countries.

PUBLICATIONS ISSUED

The Agricultural Bulletin was issued monthly throughout the year, and copies of the Annual Reports for 1924 were published. The Plant Pathologist has contributed frequently to the

local newspapers, and the Director and other members of the Department have written occasional articles. The obligation of the Department to the publishers of the newspapers is recorded.

STAFF

Mr. E. A. McCallan, Director of Agriculture, was absent from the Colony on duty in the United States of America from 9th to 21st May, and from 20th June to 13th July. The Director was re-appointed a member of the Immigrant Labour Board, and on 17th October was appointed a Marsh Reclamation Commissioner.

Mr. L. Ogilvie, Plant Pathologist, acted as Officer-in-Charge during the Director's absences from the Colony, and was on vacation leave (in Bermuda) from 1st to 15th August.

Mr. G. E. Winter, Inspector of Produce, was absent from the Colony on duty in the United States of America from 17th January to 9th April, and from 30th May to 14th June. He was granted sick leave from 25th April to 16th May, and vacation leave (in England) from 15th June to 21st September.

Mr. W. R. Evans assumed the duties of First Agricultural Assistant on 1st January. He was granted permission to retain the office of Honorary Secretary-Treasurer of the Poultry and Pet Stock Association.

Dr. R. L. Tucker, Government Veterinary Officer, was reappointed a member of the General Board of Health.

Mr. G. L. Young, Clerk, was granted vacation leave from 31st May to 10th June to attend Volunteer Camp. Miss Mabel B. Smith was appointed Acting Clerk.

Mr. E. L. Adams, Assistant Inspector of Produce, was appointed Acting Inspector during the period of Mr. Winter's vacation leave.

Mr. C. V. S. Early, Station Foreman, completed his fifteenth year with the Department on 23rd May, 1925.

FINANCIAL

The expenditure of £4,883-14-5 was authorised by the Appropriation Act of 1924 and Resolves 2 and 24 of 1925. Of this amount the sum of £4,851-16-7 was expended, and a balance of £31-17-10 remained unexpended. The sum of £129-18-9 was received for sales of vegetables and other sources, and was reimbursed to the Treasury. Produce of the value of £179-12-0 was supplied to Government and other institutions.

Statements relative to the foregoing will be found in the Appendices.

During the last ten years the expenditure by the Department, exclusive of salaries, and the receipts have been as follows:

Year	Expenditure.	Receipts.
1916	£2,497 19 0	£163 18 10
1917	2,045 5 7	156 2 10
1918	2,051 8 0	376 3 4
1919	2,722 5 8	157 18 0
1920	3,126 6 6	209 4 6
1921	5,488 15 2	176 1 11
1922	6,905 18 2	68 17 4
1923	4,163 6 10	73 0 11
1924	4,515 10 8	182 19 3
1925	4,851 16 7	129 18 9

Respectfully submitted,

E. A. McCALLAN,
Director of Agriculture.

Agricultural Station, Bermuda,
18th March, 1926.

Report of the Plant Pathologist For the Year 1925.

Agricultural Station, Bermuda,
18th March, 1926.

The Director of Agriculture,

I have the honour to submit the following report of work done during the year 1925.

Acknowledgements. I should like here to express my thanks to the Federal and State authorities in the United States of America who have in various ways assisted my work, Professor H. H. Whetzel of Cornell University for his never failing interest in questions concerning plant pathology in Bermuda, the Imperial Bureau of Mycology and Entomology for their continued assistance, and agricultural officials in various colonies for their help in various ways.

It is a pleasure to express my thanks to you personally and to the Department and Board of Agriculture and farmers and others for their continued interest.

Outlook It can be said that the outlook is distinctly encouraging, in so far as no important diseases or pests likely to affect the standing of Bermuda with the United States have been discovered, and in so far as definite means of control have been ascertained for the most important diseases and pests now present. It is in the proper application of the means of control by the grower that the chief difficulty lies.

Mycological Identification of Diseases. Prof. Whetzel and Dr. F. J. Seaver are pursuing, in co-operation with the writer, an investigation into the fungi of Bermuda, economic and otherwise.

The diseases of the Easter lily have been a subject of special study during the year. The field is a difficult one, but our knowledge is steadily increasing, and with the facts now at our disposal it should be possible to bring about a great improvement in the lily industry. A system of field inspection has been commenced which will be improved on as further facts become available.

A disease destructive to bananas has necessitated detailed study. It has been shown that this is of physiological origin.

Control of Diseases. 1. Spraying and Dusting. Both spraying and dusting were largely ineffective during the heavy rainstorms in February. During the period spraying showed a slight superiority in control over dusting. There is no question, however, that dusting provides a rapid and effective means of control under normal conditions.

Heavy applications of spray and dust were made to celery in the spring in the endeavour to control a severe outbreak of late blight. This led to some of our celery shipped to New York coming under suspicion because of the supposed presence of excessive amounts of arsenic. Although this was disproved and the shipments released growers have in many cases become timid about the application of fungicides to celery.

As I mentioned in my report last year fungicides should be applied as a preventive measure. Their effectiveness or otherwise largely depends on the time and manner of their applications. There is nothing that the Bermuda farmer needs to learn more than that most fungicides should be applied before and not after rain periods.

During the autumn the two motor sprayers belonging to the Department were put into operation on truck crops. These have been hired to farmers at very reasonable rates, operators accompanying them. They have done very satisfactory serivce, but their use involves additional expenditure on the part of the Department, which could be avoided were the sprayers used cooperatively by the farmers.

2. Virus diseases. The farmer would not be so drastic in his condemnation of "bad" potato seed if he knew a tithe of the difficulties involved in the control of leaf-roll, the chief of which is that it belongs to a "disease complex more baffling than any ever faced before."*

Apparently the only permanent solution to the problem is to import seed direct from districts in the United States or Canada where there is no marked spread of the disease or to grow a variety not so susceptible as the Bliss Triumph. As will be seen elsewhere there are distinct hopes in the first direction.

As will be shown below one, probably a few, of the diseases of the Easter lily are of the nature of virus diseases, to be controlled primarily by roguing. My first advice to an inexperienced grower would therefore be to rogue out all plants in which the leaves are streaked or curled as soon as these symptoms make their appearance. This method has been followed by several growers for some years with very marked success.

3. Plant Sanitation. The great importance of plant sanitation has been pointed out again and again. This is quite as important as spraying. Refuse from diseased crops should always be raked up and burned. As will be seen below many diseases, such as celery and lily blight, are carried over from season to season in this manner. The fields should be kept in as clean a state as possible since volunteer plants and weeds are liable to carry over disease or insect pests from one crop to another.

4. Crop Rotation. In Bermuda it is not usually possible to carry out long rotations of crops, but some attempt at rotation

*Prof. L. R. Jones, at opening of the "Boyce Thompson Institute.

should be made. One frequently sees, for instance, lettuce grown on the same patch of soil over and over again, giving on only about a fifty per cent crop each time.

5. Cultivation. Deeper and more thorough cultivation and better manuring should be practised. It is too often the case that crops are planted in shallow or poor soil and are insufficiently manured, with the result that they succumb easily to diseases and pests. For example, onions insufficiently manured go down easily before pink root and thrips, while potatoes similarly treated are especially liable to hopper-burn. Thorough and frequent tillage discourages damping off fungi and such pests as white grubs, snails and woodlice, besides keeping moisture in the ground and aiding in the fixation of nitrogen in the soil.

6. Seed Disinfection. It is shown below that some of the celery seed grown here is infected with the late blight fungus. Every effort should be made to obtain seed 100 per cent free from blight. It is quite posible that if clean or disinfected seed were obtained each year celery blight might become a thing of the past.

It is to be noted that black rot of kale and other crucifers is also carried on the seed.

Entomological. Identification of Insects. Over 300 insects have been collected and identified during the year. Among these one genus and five species were new to science. A large number of aphididae and scale insects have been collected. Over 60 of the latter have now been recorded from Bermuda.

Fruit Fly. The Mediterranean fruit fly **(Ceratitis capitata Wied.)** continues to be the most important insect pest in the colony. As described fully below it was found during the summer on fava beans, thus preventing further shipment of this crop. It has also been found on bananas.

Through the kindness of Dr. H. F. Willard, State Entomologist of Hawaii, and the Federal Horticultural Board, complete arrangements have been made for the importation from Hawaii of fruit fly puparia parasitised by **Opius humilis** Silv. This parasite, a native of Cape Colony, was introduced by Prof. Silvestri into Hawaii in 1913, where it showed itself capable of parasiting 90% of larvae in the coffee berries. Unfortunately other parasites subsequently introduced into Hawaii have been found to reduce its effectiveness there very greatly. The fact that this parasite is able to withstand fairly low temperatures and the absence of many thick-skinned fruits infested by the fruit fly in Bermuda make it seem possible that it may exercise some control over the fruit fly if established here.

Scale insects. The most important scale insects economically are the oleander scale, the palmetto scale, the purple scale of citrus, and the mealy-bug of sugar apples, etc. The first is now pratically completely under control by an introduced parasite **Aphelinus diaspidis** while there are hopes of controlling the last by similar means.

Control of Insects. 1. Insecticides. Insecticides experimented with during the year include Calcium cyanide and paradichlorbenzene. The former offers an easy and reliable method for fumigating greenhouses while the latter would appear to be of value for the control of mealy-bug on stored potatoes and bulb mites. Quantities of Yother's oil emulsion have been given away free of charge and ornamental trees and citrus trees affected with scale insects have been sprayed free of charge throughout the year.

2. Natural Enemies. The question of insect pests in Bermuda is an extremely interesting one because in the opinion of the writer it might be possible to bring about a biological equilibrium whereby the most important pests would be brought under control. It may be possible for example to control the scale insects more thoroughly by the introduction of several predatory ladybird beetles. There are at present only three species of these beetles on the islands, **Novius cardinalis** Muls., **Coccinella munda** Say. and **Scymnus terminatus Say.**, but only the first has been observed to feed on scale insects. The other two are predators on aphides, but are rather infrequent. The introduction of further lizards say from Porto Rico might be attempted at some future date. It is the opinion of the writer on the other hand that some steps should be taken towards preventing the importation and possible escape of animals brought here as pets and likely to prove noxious.

The aphididae are on the whole kept down very efficiently by internal parasites and larvae of syrphid and lacewing flies.

3. Control of Weeds. Close study has shown that many of the weeds of fallow land are host plants of the most harmful insects. Every effort should be made to utilise the ground in the summer with crops of some nature.

4. Planting Dates. A study of the best times for planting should be made by every farmer. Thus late planted onions are very liable to be attacked by thrips before they are fully grown, while late planted corn is usually severely attacked by the borer and leaf-hopper.

Quarantines. During the year restrictions were placed on the importation of citrus fruit and sweet potatoes (see below).

Inspection Services. 259 parcels of plants and bulbs were inspected by me at the Post Office during the year, 12 consignments of plants at the docks, 8 consignments of banana fruit and 7 consignments of citrus fruits. 15 outgoing consignments, exclusive of lily bulbs, were examined. 10 fumigations were carried out.

The following were among the diseases and pests intercepted:

Gloeosporium mangiferae Henn. on mango fruit and **Pseudococcus longispinus** T. T. on lime fruit from the West Indies, **Aspidiotus destructor** Sign and numerous scales already present in

Bermuda on plants from the West Indies. In 1924 the woolly aphis, **Eriosoma lanigera** Hausmann, was intercepted on plants from the Azores.

Inspection of lily fields was carried out in June, while the packing sheds were frequently visited.

Educational. Visits. A total of 464 visits to farms and gardens was paid during the year.

Addresses. Addresses were delivered to the Pembroke Arbor Society, the Somerset Garden Club and a meeting of lily growers.

Press notes, etc. Seasonable notes were submitted to the local press practically every week while practical notes were prepared month by month for the Agricultural Bulletin. A schedule of insecticides and fungicides was prepared and mimeographed.

Exhibits. Exhibits were shown at the Annual Agricultural Exhibition and the Somerset Flower Show. Use was made of posters, photographs, and of mounted insects and herbarium specimens, which were put up in Riker mounts in a permanent form. Spraying and dusting materials and appliances were kindly lent by local dealers.

Lectures to students. Lectures on elementary Botany and Chemistry were given by me every week during the Spring and Autumn to agricutlural students and others. There is urgent need for more agricultural education in the Colony.

Absence of Director. During the absence of the Director I acted as Officer-in-Charge of the Department from 9th May to 21st May and from 20th June to 13th July.

DISEASES AND PESTS OF TRUCK CROPS, FRUITS AND PLANTS OF ECONOMIC IMPORTANCE.

BANANAS (**Musa Cavendishii**). **Banana borer.** The banana borer (**Cosmopolites sordidus** Germar) was not apparently a pest of economic importance during the year. Only in one small plantation in Devonshire Parish was it found to be at all prevalent. In January it was noticed that the young suckers were decaying from the tips and that there was an excessive amount of dead leaves round the pseudostems. Examination of the bulbs revealed a large number of the tunnels of the borers while adult weevils were discovered at the bases of the leaf-sheaths. The plantation was on poor and shallow soil, factors which are apparently conducive to borer attack.

Fruit fly. Some banana fruit gathered in Paget West in April was found to be infested with larvae of the Mediterranean fruit fly. Two adult flies were bred out from infested fruit. It appears that infestation of banana fruit is not uncommon at this season, after the numbers of the fly have increased owing to infestation of the loquat crop. Fruit fly punctures were found

on green fruit in the field; these resemble small brown pin-pricks. The above information is of interest on account of the apparent immunity of the Chinese banana in Hawaii.

Black tip. Black tip was again prevalent, during a spell of dry weather from June onwards. Further observations (for previous remarks see Report for 1924, pp. 36,37) indicate that the diseased condition commences as an excessive gumming at the point of breaking of the perianth segments. Under normal conditions the flowers fall naturally without gumming a few days after emergence from the bracts. This gumming usually attracts large numbers of ripe fruit flies (Drosophila spp.) The perianth, pistil and stamens become black and in moist weather are often covered with a **Fusarium** sp. The whole flower is often covered with the frass and silky webs of a Tineid larva. The tip of the fruit is frequently covered with predatory mites of the genus **Hypoaspis (Gamasidae).** The black discolouration extends to the skin of the fruit and often progresses a few inches down one side, bringing about an unsightly appearance. Subsequently various insects attack the fruit, notably the larvae of **Araecerus fasciculatus** de Greer, which are important in bringing about the later stages of the rot, and the other insects mentioned in the 1924 report. The larvae of the Trypetid fly **Chaetopsis aenea** Wd. are also frequently found in the later stages.

Further isolations from the withering flowers again gave a Fusarium identical with that isolated in 1924. Fluorescent bacteria were also isolated from the tips of affected fruit but none of these organisms were found to be pathogenic when inoculated on healthy fruit. Neither is there any evidence that any of the insects above referred to is the primary cause of the diseased condition.

It has been found that the trouble is aggravated by excessive shading and that where the bunch is exposed to the rays of the sun the flowers tend to fall naturally and the tips of the fruits to retain their normal appearance.

The chief methods of value in controlling the trouble are to keep the plants fairly open (about 12 feet apart if in a low-lying locality), to have the ground properly drained, to remove excessive dead leaves, to admit light to the bunch, and to remove affected fruit as far as possible. It has been found advantageous to remove the purple bracts covering the hands as soon as they begin to reflex and also to cut off the male flowers at the end of the stalk as soon as the stalk has so far developed as to separate them 3 or 4 inches from the female flowers. This is done with success in the Canary Islands.

The application of various sprays (Bordeaux and Bordeaux plus nicotine sulphate and lead arsenate) did not bring about any marked improvement on young fruits as compared with unsprayed fruit.

A similar disease appears to occur or to have occurred in Jamaica, Central America, and possibly in the Canaries, and in-

formation gathered from these sources also suggests that the trouble is primarily a physiological one.

Panama disease. Reports in the London "Times" and in the local press during September on the occurrence of Panama disease (caused by **Fusarium cubense** E. F. Smith), previously confined to other species, on the Chinese banana in the Canary Islands suggested the possibility of local bananas becoming infected.

It has now been shown that this disease present in the Canary Islands is in fact indistinguishable in its symptoms from Panama disease, and that a fungus indistinguishable in culture from **Fusarium cubense** accompanies it, but authorities are of opinion that the strain of the fungus present in the Canary Islands differs physiologically from that occuring in the Western Hemisphere.

No well authenticated case of this disease on the Chinese banana has been known to occur in the West Indies or Central America although this variety has been extensively planted on heavily infected land.

The writer was therefore unable to recommend an embargo on the fruit of the West Indian banana on account of this disease. It is considered that the present embargo against banana plants and the present regulations dealing with the clean packing of the fruit are an adequate safeguard against the importation of this disease.

Mites on plantain banana. An extensive silvering of the leaves of the plantain banana was noted in Devonshire Parish in November and found to be due to a mite (**Anychus latus** Can.. **Tetranychiidae.**)

The writer has visited a large number of banana plantations throughout the year and is strongly of opinion that the output of fruit could be very largely increased if more attention were given to proper choice of land (avoidance of shallow soil and exposed situations), removal of excessive suckers (not more than two suckers should be left as followers), and manuring (the banana requires in our soil a large amount of organic manure).

BEANS. **Fruit fly.** On 29th April, Broad Windsor beans of the variety "Mammoth Long Pod" grown at the Agricultural Station were found to be heavily infested with larvae of the Mediterranean fruit fly and the common Portuguese beans grown for export to a smaller extent. The beans showing the greatest infestation were from districts where fruit trees, especially loquats, were most plentiful. The symptoms of infestation were as follows:

Eggs. Exposed on the white cottony inner surface of the pods. There was no external evidence of the infestation except a small black puncture the size of a pin-prick.

Larvae. Small larvae (first and second instars) are found in small black areas within the pods. These areas are tunnelled

to some extent by the larvae. There is little external evidence at this stage beyond a slight opaque spot or spots contrasted with the normal glossy green of the surface of the pod. This is rather difficult to notice without previous practice in examination.

Frequently black areas are found within the pods similar to those mentioned above, but with no larvae present. It is thought that the larvae may have died owing to the dry nature of the pods.

In advanced stages there is an inky black slimy soft rot with an offensive odour. The larvae frequently become discoloured. The seeds themselves are usually not burrowed into but are often discoloured by the soft rot.

On receipt of the above information the Board of Agriculture immediately put a stop to shipment of beans, and the Federal Horticultural Board was informed of the measures taken. The result has been that this variety is no more grown for export but the loss is amply repaid in the writer's opinion by the evidence of good faith thus afforded to the Federal authorities.

The beans left in the fields became heavily infested soon afterwards.

Plant bug. Severe damage to fava beans was reported by a grower in Paget Parish early in January. The young leaves at the tips of the shoots were found to be profusely covered with black spots. In the older leaves irregular holes took the place of these. There was also distortion and rolling. The injury was found to be due to a plant bug (**Lygus** sp.) Nicotine dust was placed at the disposal of the grower but he later informed me that heavy rains had washed the bugs off the plants and that he had not found it necessary to apply the dust.

Leaf hopper. The leaf hopper **Empoasca mali** LeBaron caused extensive burning to the edges of leaves of string beans in October and November. It is also troublesome during the month on the leaves of potatoes, egg-plants, and peas.

Thrips. A thrips (**Frankliniella insularis** Frank.) is very common on the flowers and leaves of Portuguese (Fava) beans. This thrips is also commonly found on the flowers of string and lima beans and is probably the cause of their frequent failure to set. Nicotine solutions are used with success against similar thrips in Florida.

Weevil. Portuguese (Fava) bean seeds are frequently attacked by the weevil **Bruchus pisorum** Linn. The eggs are laid on the green pods in the field and the larvae tunnel in the seeds and finally emerge as adults when the beans are stored. There is no practical method of protecting the bean pods in the field. If seed is to be held over for planting it should be fumigated with carbon biculphide, about 1 lb. per 100 c. ft., in an airtight box or barrel.

Looper. A caterpillar very injurious to the leaves of soy beans and cowpeas during the summer months was bred out and

proved to be the larvae of **Phytometra** oo Cram., common also on potato leaves. Other pests of cowpeas include the common fireworm, **Xylomyges eridania, Empoa sca mali,** and an aphid.

Mildew. Against the powdery mildew (**Erysiphe polygoni** D. C.), very prevalent and destructive during the winter months to string and lima beans, fairly good results were got by dusting with sulphur dust during the heat of the day.

Anthracnose. Bean anthracnose, caused by the fungus **Colletotrichum lindemuthianum** (Sacc. & Magn.) Bri. & Cav., was found to be causing rather serious spotting of the pods of string beans in one planting in January. The disease was too far advanced to warrant control measures. It is carried over from season to season on the seed.

.. BEETS. **Webworm.** Some damage was done to the leaves of beets in February and October by the beet webworm **Hymenia fascialis** Cram., a pest which is easily controlled by the application of arsenical poisons. This pest has been found to breed commonly on wild purslane, **Portulaca oleracea** L.

Fireworm. The common fireworm **Xylomyges eridania** Cram. was also the cause of some damage to beets in October.

A large amount of loss occurs annually from damping off of beet seedlings, a disease from which a **Pythium** has been isolated. This disease is most prevalent in low-lying badly drained spots and such spots should therefore be avoided as far as possible.

The fungus **Cercospora beticola** Sacc. was again prevalent in February, but only on the leaves of mature plants.

CELERY. **Damping off.** Much loss was incurred from damping-off of celery in the seed beds during the winter months of 1924-1925. Accompanying the damping-off was a very marked stunting and yellowing. Nematode galls are frequently found on the roots of such plants. The ground on which most loss occurred had been turned over for the first time and was apparently insufficiently aerated. It would be well for farmers to exercise great care in the choice of land for celery seed beds. Such land should not be too shaded or badly drained, but should be friable and well aerated. It should have grown some other crop successfully at a time closely previous to sowing the celery.

Drop. The lettuce drop fungus **Sclerotinia sclerotiorum** (Lib.) Massee was found causing dying off of celery seedlings in circular patches during January. Such damping-off is apparently not uncommon and should be controlled by removing all the plants from the diseased areas and the healthy ones to the distance of at least a foot and by drenching the infested area with a strong bluestone solution.

Root aphis. The root aphis **Anuraphis tulipae** Boyer is commonly found on the roots of celery, but apparently causes little damage. This aphis occurs on the roots of carrots and

parsley and is controlled by drenching with a nicotine sulphate solution.

Nematode injury. Plants with bright yellow leaves were to be seen scattered about in many celery fields from April onwards. The roots of these were thickly covered with nematode galls (? **Heterodera radicola** Atk.). This condition is not common enough to warrant control measures. The sporadic occurrence of the infestation is probably due to attack in the seed-beds. In Florida this is one of the most serious troubles of celery.

Fireworm. The only insect found to be at all destructive to celery was the common fireworm (**Xylomyges eridania** Cramm.)

Late blight. Late blight (**Septoria petroselini** var. **apii** Br. & Cav.) was present in serious quantity as early as January in certain farms and was prevalent throughout the season. The importance of the control of this disease in the seed bed and the disastrous results which follow from planting out infested seedlings was pointed out but went largely unheeded.

The infestation was thoroughly investigated during March and the following observations made:

The extremely wet weather during the third week of February was very favourable for the spread of late blight of celery, which had in many cases been allowed to develop to a large extent in the seed beds.

The following points are to be noticed in this connection:

(a) Examination of the celery seed by me previous to planting failed to reveal the presence of any appreciable amount of blight pustules.

(b) In many cases I was told that there had been no blight in the seed beds, but it is possible that it had developed sporadically here and there.

(c) A small number of the fields were entirely free from blight.

.. (2) It was generally agreed that during that time dusting was of little value both on potatoes and celery.

Some little control was got by spraying. It should be noted, however, that the weather conditions were distinctly exceptional.

(3) The failure of the dust to check the blight during this exceptional period (the last weeks in February) led many to go back to the old spraying methods.

(4) Conversation with growers has convinced me that during a normal season, as in 1924, dust may give effective control when carefully and intelligently applied.

The following are the chief points to be considered when making a choice between dusting and spraying:

1. **Cost of Materials.** The retail cost of copperlime dust is 40 to 50 shillings per drum of 100 lbs. At the rate of 35 lbs. per acre (a thorough dusting) this would cost 14 shillings per acre.

The cost of the materials of lime-Bordeaux (5-5-50) is as follows: Copper sulphate costs 6 pence to 10 pence per lb. and unslaked lime 4/- per bushel (about 80 lbs.) The cost of the amounts needed for spraying one acre (100 gallons per acre) are about 6/6 and 6 pence respectively. The cost of the materials for an application of lime-Bordeaux would thus be 7/- per acre, about half the price of the dust.

Soda-Bordeaux or Burgundy mixture is used by a number of farmers. (It has the advantage of being easily made and not likely to clog the sprayer. On the other hand the proportions have to be weighed out carefully). The cost of washing soda is 4 pence per pound. The cost of the materials for spraying an acre with soda-Bordeaux would be about 10/4.

"Pyrox" at its usual strength of 1 lb. to 5 gallons and at the rate of 100 gallons per acre (giving considerably less copper than in the case of Bordeaux mixture, but containing lead arsenate in addition) costs 18/- per acre.

2. **Labour and Time Involved.** The proportionate labour and time involved in dusting and spraying varies according to the size of the plot, the distance from which water has to be carried, and previous experience in making up spray mixtures. It may be said, however, that with the spraying apparatus commonly used here, the total time taken to spray a plot about 20 rods would be at least four to five times that taken to dust it. If extra assistance is employed (at the rate of 1/3 or so per hour) the proportionate expense of spraying would amount up rapidly.

3. **Availability of Dusts and Sprays.** It is obvious that on the other hand that dusting can be done readily at an opportune moment, for example when the wind shifts round to the south and muggy weather is hanging around.

4. **Covering of Leaves.** There is no doubt that spraying is more effective in unpractised hands than is dusting. Dusting to be effective must be done thoroughly at the correct time. It is more difficult to cover the entire surface of the leaves of the plant with dust than it is with sprays. This is very evident in many cases in potato fields where the lower leaves are often not touched at all by the dust. The usual methods of dusting potatoes here are far from effective. It is relatively easy to cover the entire upper and lower surfaces of the leaves with spray if a good pressure is employed.

It should be the prime object of the Board and Department to make all farming materials and methods as inexpensive and as simple for the farmer as possible and with this in view the following suggestions are put forward:

1. As already hinted, the advantages and disadvantages of the two methods should be pointed out clearly to the farmer.

2. The time which would be saved by making up stock solutions of sprays for subsequent dilution should be pointed out.

3. Unfortunately none of the dusting machines now in use are entirely satisfactory. A keen look out is being kept for anything better. Their cost is excessive.

4. As pointed out by Prof. Whetzel, the spraying nozzles used by farmers are antiquated. Dealers should be urged to stock only the latest types.

The importance of sanitary measures in the disposal of blighted material was emphasized in the Agricultural Bulletin in the course of the summer. All rubbish from blighted celery should be raked together into a corner of the field, allowed to wither and destroyed by burning. That blight is carried in this way throughout the summer was demonstrated in the following manner. Refuse from blighted celery was forked into a piece of fallow ground previously well soaked with a strong formalin solution. The piece of ground was isolated from celery fields by about a quarter of a mile. Surface sterilised celery seed was sown in the bed in the autumn and the seedlings subsequently developed blight.

The seed beds should be well isolated from the field in which the seedlings are destined to be planted out, so that if any disease or destructive insect pest appears in the seed bed it may not spread easily to the field. A case in point is that of celery last spring. In not a few cases blight developed in the seed beds and although clean plants were put out in the field nearby, blighted plants were left in the seed bed, and of course proved a continual source of infection for the main field. It is of the greatest importance then to have the seed beds well isolated, preferably in two or three places, and secondly to clean up the seed beds thoroughly after transplanting.

As late as October badly blighted celery plants were found among pond sedges. The advisability of cleaning these up when the crop is harvested is obvious.

The seed for planting in the autumn of 1925 was very thoroughly examined by me. Of eight samples three were found to contain a serious quantity of late blight pustules, one sample running up to 86.6 per cent. infected seeds. Steps were taken to prevent as far as possible the planting of infected seed and the appearance of the crop at a later date showed that plants grown from the clean seed were on the whole free from blight.

Seedlings grown by the writer from badly infected seed in the greenhouse under dry conditions did not show any blight infection.

The chief French growers of celery seed have kindly taken the matter up and are now prepared to supply only clean or disinfected seed.

CITRUS. **Embargo.** On account of the danger of the introduction of the citrus black fly (**Aleurocanthus woglumi** Ashby) an embargo was recommended prohibiting the importation "from the West Indies and Bahamas of citrus plants and citrus fruits unless free from leaves, twigs and other portions of the plant." This amendment was approved by the Governor-in-Council under the provisions of The Plant and Bulb Diseases and Pests Act, 1921, on 29th April, 1925.

Spraying, Etc. Good results were got from the use of a cold water emulsion prepared from lubricating oil and Kayso, a proprietary spreader. A revival of interest in citrus growing is evidenced by the large number of citrus trees imported during the year and by the number of applications for oil emulsion, small quantities of which were given away free of charge by the Station.

The writer is strongly of opinion that citrus can be grown with much success in Bermuda provided reasonable care is taken in cultivation and in the control of diseases and pests. The Station orchard well demonstrates the response of the trees to pruning, fertilisation and spraying.

The following are essentials for success:

1. The grove must be in a well sheltered spot, screened on all sides from draughts.

2. The soil should be reasonably deep and well drained.

3. The plants should be named varieties, preferably on sour orange stocks.

4. Roots from other trees must not be allowed to invade the grove, and the ground must be kept reasonably free from weeds.

5. The trees should be looked over at least once a year and all dead and diseased branches, water sprouts and interfering and crossed limbs should be pruned off and the limbs painted over.

6. The ground should be ploughed or forked thoroughly once a year, preferably in March or April.

7. The trees must receive a heavy mulching of manure and trash at least once a year. Stable manure, trash and sweepings, leaves, seaweed, cover-crops, weeds, and prunings are all useful.

8. The trees must be sprayed thoroughly at least three times a year, in May, June, and September or October, with an oil emulsion to control the purple scale and cloudy-winged white fly. This is absolutely essential at present.

Parasitic Fungi. The yellow aschersonia fungus, parasitic on the cloudy-winged white fly, imported from Florida and

sprayed on the trees in July, 1924, was found to be well established in the orchard in November, 1925.

CORN. (Maize). **Borer.** The borer common on corn during the summer months has been bred out and identified as **Chloridea obsoleta** Fab., a very well known and cosmopolitan insect.

This is a difficult insect to control. It will be found that early-planted corn is usually only slightly affected. Silks and foliage of sweet corn are sometimes poisoned by the application of lead arsenate dust, three to five applications being made. Much benefit has been recorded in the States from the treatment, but it has not yet been proved to be practical for field corn on account of the expense involved.

Leaf Hopper. The corn leaf-hopper, **Peregrinus maydis** Ashm, has been found to occur very commonly on **Eleusine indica** (L) Gaertn. a grass found on roadsides and fallow fields. It has also been found on the grass **Panicum dichotomiflorum** Michx. and on sugar cane. It is especially abundant on late corn.

CUCURBITS. **Downy mildew.** The downy mildew **Peronoplasmopara cubensis** (B. & C.) Clint. was the cause of severe injury to musk melons at the Station during May and June. The disease is very difficult to control unless taken in hand early.

Borers. Good control of the melon borer (**Margaronia hyalinata** L.) on musk melons was got by spraying the leaves with lead arsenate at the rate of ¾ oz. per gallon at intervals of about 10 days. The larvae of this borer feed on the leaves and subsequently enter the melons. The adult moths have been bred from larvae occurring on the leaves of **Clerodendron fragrans** Vent. and on the leaves of **Acalypha.**

The adult of the pickle worm **Margaronia nitidalis** Cram., a serious pest in the States, has been captured, but the larva is apparently not common in Bermuda.

White Fly. The white fly **Trialeurodes vaporariorum** Westw. is common on the leaves of squashes during the summer months.

Leaf Hopper. The burning of the edges of the leaves of water melons is associated with the presence of the leaf hopper **Empoasca mali** L. Spraying with Bordeaux was recommended in one instance against this insect.

Plant Bug. The bug **Anasa scorbutica** F. is found on cucurbits during the summer.

Wood Lice. Pumpkins are commonly bored by wood lice or hog lice (**Armadillium vulgare** Latr.) (For control see under miscellaneous).

EGG PLANT. **Leaf Roller.** The leaf roller **Psara periusalis** Wlk. was again destructive to egg plants. It is difficult to control by arsenicals unless these are applied during the early larval stages.

Aphid. An attack by the melon aphid (**Aphis gosypii** Glover) in July was controlled successfully by means of nicotine dust. This aphid is parasitised by **Aphidius testaceipes** Cress.

KALE. **Black Rot.** Black rot (caused by **Bacterium campestre** (Pammel) E. F. S.) is prevalent on the edges of the leaves of kale throughout the season and was especially common during the wet weather in February. It is frequently mentioned by the Inspector of Produce in his reports from New York.

This disease has been largely controlled in certain sections of the United States by sanitary measures, i. e., destruction of refuse, rotation of crops, and by avoiding the use of seedlings from any seed-bed where even one diseased plant has been found. As the causative organism is carried on the surface of the seed, it would be well to disinfect the seed with corrosive sublimate or alternatively to obtain seed which the producers guarantee to be clean.

Aphid. The aphid **Aphis brassicae** Linn. has been found on kale and cabbages. This aphid, which is covered with a whitish mealy coat, is apparently not so common as formerly and is largely parasitised. It is very frequently found on derelict kale plants allowed to remain in the ground. It is to be controlled by removing such plants at the end of the season, and by the use of nicotine preparations—nicotine dust or Black-leaf-40—if it is causing injury to the plants.

Leaf-Miner. The leaf-miner **Agromyza pusilla** Meigen was troublesome as usual in the later months of the year on leaves of cabbage, cauliflower, kale, etc. It has been observed that the miners are often responsible for the spread of the black rot bacteria throughout the leaf. Where this pest occurs in small gardens it may be controlled by picking and destroying the infested leaves in the seed beds, or when planting out. Nicotine preparations have been used in an effort to control the pest but without success.

LETTUCE. **Drop.** Lettuce drop caused by **Sclerotinia sclerotiorum (Lib.)** Massee appeared in the Station plots in December and was checked by removing the infected plants along with some of the surrounding soil and watering the spaces with formalin 1-40 and covering them for a few days.

Stunt. The disease known as stunt, referred to by Prof. Whetzel in his report for 1921, was especially troublesome during wet weather in December. This disease was found in practically all the lettuce plantings examined and in many cases caused loss to the extent of about 25 per cent. It has occurred here on virgin soil. A **Pythium** has been isolated from the roots of diseased plants. No methods for controlling the fungus in the field are known. Plantings on well drained land are less affected.

Rain Injury. In February lettuce plants were injured by the heavy rains in certain localities. The nature of the injury was somewhat transparent dead blister-like spots which were at first

green, but which later died off, leading to a soft rot of the whole lettuce. The damage was found only on leaves lying horizontally and may have been caused either by direct impact of the rain drops or by bright sun striking the wet leaves, probably the former.

LILY (**Lilium longiflorum** var. **Harrisii**). An official inspection of the Easter lily fields was carried out between 30th May and 3rd July with the object of ascertaining the amount of diseased and off-type bulbs present in the fields and of collecting information with regard to the position of the lily industry. Certificates were issued to the growers similar to those issued for seed potatoes in the United States. These certificates were submitted to the inspector of bulbs at the packing shed and enabled him to correlate the field conditions with the condition of the bulbs after digging.

It can be said definitely that this inspection was of great value in drawing the attention of the growers to the need of roguing out diseased and off-type plants and of taking reasonable precautions against fungoid diseases.

It is not claimed that the inspection in 1925 was entirely perfect. The late date of the inspection made it very difficult in some cases to distinguish early-flowering Harrisii types from late-flowering longiflorum types and prevented one in some cases from diagnosing disease accurately. As a preliminary measure, however, it was of great value, as can be seen from the greatly improved condition of the fields this season (1926).

The following were found to be the chief characteristics of the early- flowering Harrisii types as compared with the late-flowering longiflorum types:

(a) Bulb scales pointed (in late-flowering types broad and rounded, but not invariably).

(b) Bulb characteristically of loose texture (late-flowering bulb very compact.)

(c) Bulb without a prominent crest, which is usually present in late-flowering types.

(d) Small production of stock. Longiflorum types produce a large amount of stock.

(e) Leaves curling downwards at tips. Late-flowering types usually stiff and pointed.

(f) Leaves without the characteristic gloss of the late-flowering types.

(g) Leaves with prominent depressions along veins.

(h) Flowers of soft texture.

(i) Flowers with petals reflexed at tips.

(j) Flowers turned slightly downwards.

(k) Usually no seed-pods (not invariable). Niches and grooves on the scales often occur in Harrisii bulbs, but are not entirely characteristic.

With regard to diseases and pests it should be stated that no disease or pest apparently of recent origin was encountered and that no disease or pest was found capable of harming other crops in the United States.

Basal Rot and Storage Diseases. It has been ascertained that the condition referred to as basal rot in my 1924 report is invariably associated with the bulb mite (**Rhizoglyphus hyacinthi** Banks.)

It was shown in my 1924 report that the rotten condition of the base of the bulbs was very frequently associated with rusty brown streaks on the leaves. It is now practically certain that quite a number of causes can bring about similar symptoms, as will be seen from the remarks below. The streaking caused by basal rot can, however, be differentiated from streaking due to other causes by the absence of any light yellow streaks or blotches accompanying the brown streaks.

It has been shown too that these rusty brown streaks are not an invariable accompaniment of basal rot, but are present only in its later and more severe stages.

A parallel condition has been observed in the case of narcissus bulbs where precisely similar symptoms at the bases of the bulbs were accompanied by similar rusty spots on the leaves.

It is generally believed in Holland that the bulb mite is incapable of causing primary injury to bulbs. This is only partly true, in so far as under certain conditions the mites can penetrate healthy tissues. Examination of the bases of narcissus plants which had apparently healthy tops, but which were growing amongst other plants which showed the characteristic symptoms on the leaves, revealed tunnels of the mites running into the tissues just at the base of the roots. The bulbs were otherwise entirely healthy.

The mite is however attracted to decaying vegetable matter and will very frequently multiply thereon and subsequently penetrate healthy tissues. It has been found for instance that if lily bulb scales are held under dry conditions a physiological breakdown may occur, a dry sunken area of the surface, usually near the base of the scale. Such areas have been found to develop on healthy scales under sterile conditions in petridishes where the scales have been slightly bruised at the edges and tips.

To such areas mites are attracted and quickly mine the tissues. Mites are also found frequently on the small pocks caused by the black scale fungus. The necrotic areas are attacked by the bulb mite which, under suitable conditions, brings about a very rapid disintegration, the whole scale disappearing into the form of a brownish powder, consisting of dead cells.

Under ordinary soil conditions bruised areas on the bulbs were found to callus over, but bulbs placed in wet soil under conditions of poor areas extending slightly up the scales which subsequently fall apart and form bulbets at their bases.

It is thus evident that although the mite is capable of entering healthy bulbs and causing the condition referred to as basal rot it is apparently attracted by decaying tissues of the plant it excavates and later penetrates to normal tissues. It is therefore advisable to clean off withering scales and any basal rot which may be present both before storage and before planting. It has been found that in ordinary soil a callus quickly forms over the exposed parts.

At least three fungi have been commonly found on lily scales under storage conditions, a **Rhizopus**, a **Penicillium** and an **Aspergillus.** These fungi do not develop to any injurious extent if the bulbs are stored under the usual conditions, in clean sand fresh from the sand pits (i. e., containing a certain amount of moisture) in tightly nailed boxes. The first especially, however, has been found to be the cause of marked injury among bulbs stored under unsuitable conditions, e. g., in loose boxes or in barrels.

It is a good cultural direction for all species of lilies to keep them out of the ground for as short time as possible. It is known for instance that the Japanese leave their bulbs of longiflorum in the ground over summer, and dig them only for replanting. The value of such a practice was clearly seen in the case of a quantity of bulbs which were left in the ground over summer and dug on 16th October, and in which the scales were plump and free from disease. There is however a large amount of risk attached to such a practice—injury from ground insects and from sunscald. The next best method is therefore strongly recommended —storage in clean sand in closed boxes.

An attempt was made to discover an easy method of killing the bulb mite without injuring the blubs. Fumigation with paradichlorbenzene at the rate of about 3 g. per cubic foot for 36 hours was found to be effective in killing all the mites both in the interior and exterior of the bulbs, but some of the eggs hatched out later. Soaking in corrisive sublimate 1-1000 for half an hour (without subsequent washing) was found to kill about 80 per cent. of the mites. The use of paradichlorbenzene against the bulb mite has been found to be effective in the States by Dr. L. O. Howard, Government Entomologist Report of the Entomologist, Washington, 1922) and has recently been recommended by investigators in England both against this mite and against the aphid **Anuraphis tulipae** (Stention, R. "Control of Aphides infesting bulbs in store." J. Min. Agr., England. 32, No. 11, Feb. 1926, p. 1037).

Black Scale. The fungus causing black scale (**Volutella** sp.) —see Annual Reports for 1922, 1923, was found during the month of May on dead Easter lily stems and leaves, from whatever cause they had died. It is considered that the spores of this fungus are washed from the decaying leaves and stems down to the surface of the scales where they bring about the characteristic pocks and

subsequently cause a soft black rot. This disease spreads rapidly in storage under damp conditions. Spraying of the foliage should be continued right to the end of the season.

Botrytis Blight. Botrytis blight was prevalent on two farms at St. Davids Island on 31st January, an early date for an outbreak of this disease. It was controlled by picking off the affected leaves and by spraying with Bordeaux mixture. The disease continued to be prevalent right through the season, but was adequately controlled by spraying.

The fungus developed small sclerotia or resting bodies in pure culture and on infected flowers and leaves placed in moist chambers. The writer has not found sclerotia on bulbs. Sclerotia from the fungus in culture kept over the summer gave rise to mycelium and spores in October.

These facts indicate the necessity for cleaning up thoroughly refuse from blighted plants.

Burn. A condition much resembling blight, but unaccompanied by the characteristic blight spots, is very probably due to scorching from light soil. The leaves die off from the tips and have a dark brown burnt appearance.

Chlorosis. An extreme case of chlorosis of lilies was reported from Smiths Parish in February. The worst plants were bright yellow, severely stunted, and had a poorly developed root system. The condition was spreading to rather large areas in the field, the later affected plants showing the chlorosed appearance at the tips only.

Applications of ferrous sulphate, manganese sulphate, magnesium sulphate and of various fertilisers were made, but no favourable results were obtained.

Plants grown from some of the affected bulbs in ground at the Agricultural Station produced markedly chlorosed plants, but this condition passed off as the season advanced.

Mosaic Diseases. There are apparently at least two true mosaic diseases of the Easter lily, one of which is probably transmitted by the lily aphis (**Aphis** sp. near **gosypii**).

Phytophthora Rot. (Stump rot). This disease, caused by a fungus of the genus **Phytophthora**, attacking the centres of the rosettes, (See Annual Report, 1921), brought about extensive loss in certain fields during December. The disease followed the path of drainage water. Its appearance in the Station plots was interesting as these plots had apparently never borne lilies before and the scattered nature of the incidence of the disease would appear to point to its being carried in the bulb in the form of resting spores. One cannot too strongly urge the value of spraying lilies right through the season. Lilies affected by this disease will usually produce fresh shoots, but there is grave danger from allowing an infected field to go unsprayed as heavy rains may

cause very extensive loss. Injury very similar to the above, due to some injurious chemical in castor pomace, was observed in December.

Yellow Flat. This disease is considered by the writer to be one of the most serious and most insiduous of those affecting the Easter lily. It is found in practically every field in Bermuda to some small extent, but in some fields its incidence is very marked. During the 1925 inspection it was found to be present to the extent of over 50 per cent. in certain fields. Regulations have been put into force during the present season (1926) whereby not more than one per cent. is allowed among plants producing saleable bulbs.

The symptoms are as follows. Pronounced downward curling of the leaves, accompanied by a pale cast. Leaves not striped or mottled. Bulb small, flat, with large production of side stock from the stem. Infected bulbs may produce a few apparently healthy leaves, followed by the characteristic downward curled leaves. The whole plant is greatly dwarfed, in severe cases only a few inches high. In the case of current-season infection there is an abrupt production of the characteristic symptoms. In fairly mature plants the leaves are usually not so markedly curled downwards, but there is a certain amount of twisting.

Bulbs from diseased plants produce diseased plants in the following year.

This disease has been noticed for some years by Mr. H. E. D. Smith, St. Davids, who observed that it spread from plant to plant and who gave it its name of yellow flat.

There were early indications that the disease was spread by the lily aphis. One grower reported a large number of aphids on a certain spot in his field in February, and a few weeks later the plants at this spot were found to be badly infected with the disease, which subsequently spread to other parts of the field.

The disease occurs in spots in the fields a few yards in diameter, the centre of the spot being occupied by a badly affected plant.

Although extensive experiments have not yet been carried out, there is very strong evidence that yellow flat is a virus disease, carried from plant to plant by the lily aphis.

It is to be controlled by roguing out affected plants as soon as the symptoms become apparent.

Aphis. This aphid has not yet been definitely identified, but has been placed near **Aphis gosypii.** It begins to appear in the field early in the season, having been found in a garden in St. Georges on 11th December. It remains prevalent throughout the season, being especially prevalent during the early months of the year. By the beginning of May it has largely disappeared. It is largely kept under control in these warmer months by an

internal parasite (**Aphidius testaceipes**) and by the larvae of syrphid flies (**Allograpta obliqua** Say, and **Toxomerus marginatus** Say.) and by ladybird beetles.

The importance of this insect in the spread of yellow flat and also probably of certain of the mosaic diseases, which are not so common, but yet are of considerable importance, make its control a matter of some concern. It can be controlled very easily by the use of nicotine dust or Black-leaf-40 (1-800) with the addition of three to five pounds of soap per 100 gallons liquid. These insecticides should be applied during the heat of the day. The latter may be used along with Bordeaux mixture.

White Grubs. Some growers had trouble with white grubs (**Ligyrus** sp., ? **Ligyrus gibbosus** de G.) during April, and shortly after planting time. The symptoms of white grub injury in the field are somewhat spindly shoots in which the leaves do not expand as in normal plants. These grubs are to be found in large numbers in ground which has been allowed to go to grass. The trouble may be avoided to a large extent by planting cowpeas or soy beans during the summer and by deep and early ploughing.

LOQUAT. **Caterpillar.** The caterpillar of a pyralid moth is frequent amongst the loquat flowers and young fruit, causing many to fail to mature. The moth has been bred out, but not yet identified.

Aphid. The aphid **Aphis pomi** Del Guerc is common on loquat shoots during the summer and is accompanied by sooty moulds.

Weevil. The weevil **Diaprepes famelicus** Oe subsp. **esuriens** Gyl. was injurious to loquat leaves.

Fruit Fly. See under "Fruit Fly" above.

OLEANDER. **Scale.** The scale **Diaspis pentagona** (Targ.) is now practically completely controlled by the parasite **Aphelinus diaspidis** Howard, introduced from Italy by Prof. Whetzel and later by the writer (See previous reports). The scale was still fairly destructive to cultivated geraniums, but on these too its incidence appears to be waning.

In one case this scale and the scale **Morganella maskelli** Cockerell were found on oleander roots several feet below the surface of the ground, a fact which shows the difficulties in the way of artificial control of this pest.

It should be noted here that during 1921 and 1922 the artificial control of this scale cost the Government the sum of £4,092.

Two consignments of the predatory ladybird beetles of **Chilocorus bipustulatus** and **Rhizobius lophantae** imported from Italy in July failed to arrive in viable condition.

ONION. **Pink Root** (**Fursarium malli** Taub.) Pink root injury was apparent in the fields as early as January, being evidenced by the pale colour of the tips, but was not apparently

of serious importance, owing probably to the heavy rains of February. The value of frequent light dressings of nitrate of soda were again apparent.

Blight. One severe attack of onion "blight" or mildew (**Peronospora schleideni** Unger) was observed in Devonshire, fortunately in a well isolated field.

Thrips. Severe attacks of the onion thrips (**Thrips tabaci** Lind.) occured on the onion crop in February. Several applications of nicotine dust were made in several localities without apparent benefit, the thrips having apparently become too numerous for control measures to be effective. Heavy rains at the end of the month checked the attack very considerable.

The thrips produce a generation in about two weeks so that they can multiply very rapidly if the weather is favourable. It is of the first importance to apply control measures (nicotine dust or spray) when the thrips are first seen in the fields. Beds of onion sets should be situated some distance from the main fields since they tend to breed the pest in such numbers as to insure the infection of the main crops. The fields should be well isolated, if this is possible.

It is to be noted that anything which will bring about an earlier ripening of the onion, such as early planting or the cultivation of an early maturing strain, would tend to reduce the amount of injury from both thrips and pink root as both these organisms are favoured by high temperatures.

POTATO. **Late Blight.** Late blight (**Phytophthora infestans** de B.) was everywhere prevalent on the spring crop and again in December and every opportunity was taken to urge the desirability of spraying and dusting. As stated above, the power sprayers belonging to the Department have been doing effective work against late blight.

Leaf-Roll, and Mosaic...For leaf-roll and mosaic counts the reader is referred to the Director's report. The Bermuda farmer has reason to congratulate himself on the continued excellence of the certified seed imported from Nova Scotia.

The Triumph seed imported from Long Island showed on the whole a reasonably low percentage of leaf-roll. As will be seen from the Director's report every effort was made to ensure that only seed showing a safe percentage of leaf-roll should be imported into Bermuda.

Might I emphasize here the fact that not more than one per cent. of the farmers nor of those interested in agriculture generally in Bermuda realise the almost unsurmountable difficulties in the way of obtaining Bliss Triumph seed with a reasonably low percentage of leaf-roll from Long Island.

As will be seen from the Director's report the recent very interesting experiments of Dr. F. E. Denny at the Boyce Thomp-

son Institute possibly offer a way of escape from these difficulties For a detailed account of our present knowledge of leaf-roll the reader is referred to my article in the Agricultural Bulletin for December, 1924, and January, 1925.

Spindle Tuber. The virus disease known as spindle tuber was found in November among plants grown at the Station from Triumph seed imported from Nebraska. According to a recent bulletin spindle tuber is one of the most common virus diseases of the potato in that State.

Storage Fungi. Potato tubers stored over the summer in St. David's Island were attacked by a fungus apparently identical with **Sclerotium rolfsii** Sacc., which brought about a dry rot. As this fungus forms mustard-seed like resting bodies a thorough cleaning up of the infested tubers is of the first importance.

Premature Tuber Formation. Some cases of non-germination of potato tubers associated with premature tuber formation came to my attention. It is probable that the condition was brought about by premature ripening of the tubers owing to excessive drought in the seed fields in Nova Scotia and New Brunswick. Another kind of seed planted in the same field gave no premature tubers. The condition is distinct from that observed in 1923.

Leaf-Roller. The leaf-roller **Psara periusalis** Wlk. occuring on potatoes during the warmer months, also found on egg-plant and tomatoes, has been bred from **Solanums nigrum** and ornamental solanums.

Fireworm. The fireworm (**Xylomyges eridania** Cram.) was common on potato leaves in October, and necessitated dusting or spraying with arsenicals. This pest has been noted from a lengthy list of cultivated plants and weeds.

Mites. In fields of early Triumphs in Devonshire and Paget the leaves of certain of the plants were found in December to be bronzed and somewhat spotted on the back and the veins and petioles somewhat darkened. Mites were found on the leaves. These were not definitely identified but both the symptoms on the plants and the mites themselves corresponded closely with the mite disease described in "Potato Diseases in Hawaii and Their Control" (Hawaii Bull. 45, p. 31).

Leaf-Hopper. The leaf-hopper **Empoasca mali** le B. was the cause of severe hopper-burn in several fields in October. This insect is seldom of any importance at the Agricultural Station owing to the regular dusting or spraying programme carried out there. The hopper is generally found on plants in insufficiently manured fields.

False Chinch Bug. The false chinch bug (**Nysius ericae** Schill.) was found on wild purslane in a field in Smiths Parish in September. This bug caused rather severe injury to potatoes in 1921.

Mealy Bug. The common mealy bug (**Pseudococcus citri** (Risso.) was injurious to the sprouts of potato tubers stored throughout the summer. It is also been found here on citrus leaves and croton shoots. I have also found it at the bases of lily bulbs and celery plants, but it does not appear to do these plants much harm.

It is to be noted that if the sprouts are not noticeably injured when the tubers are planted, healthy plants may be produced even though the tubers are infested with the mealy bug. Thus infested tubers planted on 3rd September yielded a fair crop when dug on 24th November. The mealy bugs had spread to the roots and stem and were found on the eyes of the tubers when these were dug.

The infestation of stored potato tubers here probably originates from mealy bugs on one or two tubers when they are dug. The tubers should therefore be inspected before they are stored. To prevent possible infestation from outside the tubers should be protected from ants by storing them on tables with their legs dipped in kerosene or surrounded by cloth bands dipped in corrosive sublimate solution.

Tests were made with various substances in the endeavour to obtain a simple method of killing the mealy-bugs without injuring the tubers. The following results were obtained:

1. Tubers soaked in 40% nicotine sulphate 1-400 for 2 hours at 70° F. About 60% mealy-bugs killed.

2. Tubers soaked in whale oil soap at the rate of about ½ oz. per gallon for 1 hour at 70° F. About 80% killed.

3. Tubers soaked in water at 70°F. Most of the adults alive after 24 hours in water.

4. Tubers dusted with 6% nicotine sulphate dust. Tempre in sun 110°F. Exposed to dust 24 hours. After that time practically all alive.

5. Tubers dusted with nicotine sulphate (2%) and sulphur dust. Tempre in sun about 110° F. About 80% killed. Mealy-bugs active on check tubers.

6. Tubers fumigated with hydrocyanic gas at the rate of about 1 oz. sodium cyanide per 100 c. ft. for 1 hour. About 80% killed.

7. Tubers soaked in Yother's lubricating oil emulsion 1-40 for 1 hour. About 80% killed. Tubers killed.

8. Tubers subjected to a strong jet of water from a hose pipe. This gave very good results.

Very good results were reported by a farmer who used nicotine sulphate 1-400 with the addition of ½ oz. whale oil soap per

gallon. The tubers were soaked for two hours and afterwards rinsed in water. A good growth was got from tubers treated in this way and planted at the Station.

Paradichlorbenzene at the rate of 5 g. per c. ft. for 48 hours at 25°C. was found to give a 100% kill of the common mealy-bug on lily bulbs without injurious effects to the bulbs and probably this chemical would be similarly effective against the mealy-bug on potatoes. A temperature above 20°C. is apparently necessary for effective results to be obtained.

A parasite (Leptomastideae sp.) of the common mealy-bug, imported into California from Sicily a few years ago, has apparently exercised some control over it in the former country. Mr. H. S. Smith of the California College of Agriculture has kindly offered to send the writer a consignment of parasitised mealy-bugs when conditions are favourable for the introduction of the parasite.

STRAWBERRY. **Negro Bugs.** Injury to strawberry fruit by small black bugs was reported from Somerset in April. The insect was found to be **Pangaeus bilineatus** Say., also found in Florida and Michigan, in the latter place injurious to celery, and very common in Bermuda soils.

In Michigan it has been found that a spray of crude carbolic acid is very effective in driving them away. A tablespoonful is used to two gallons of water. This should be used after the fruit has been picked.

SUGAR APPLE. **Mealy-Bug (Pseudococcus nipae (Mask.)).** The sugar apple mealy-bug continues to be an important pest of sugar-apples, guavas, avocados and palms. Spraying with oil emulsions is effective for a time, but must be carried out frequently.

This mealy-bug has been very effectively controlled in Hawaii by the introduction of a parasite, **Pseudaphycus utilis,** from Mexico, and efforts are being made to obtain parasitic material from these sources.

SWEET POTATO. **White Rust.** White rust (**Albugo ipomeae-pandurae** (Schw.) Sw.) was found in a field of sweet potatoes in Somerset in December. It is usually regarded as of minor importance in the United States and West Indies.

Scarabee. The sweet potato scarabee (**Euscepes batatae** Waterhouse) was found on sweet potato tubers, but is not considered to be a pest of any great importance in Bermuda.

Embargo. On account of the danger of the introduction of the sweet potato root-borer (**Cylas formicarius** Oliv.) an embargo was recommended prohibiting the importation of sweet potatoes from the United States, Cuba, Bahamas, British Guiana, Jamaica, the Canal Zone and Porto Rico. This amendment was

approved by His Excellency the Governor-in-Council under the provisions of The Plant and Bulb Diseases and Pests Act, 1921, on the 29th April, 1925.

TOMATO. **Cutworms.** Tomato seedlings at the Station were badly injured by cutworms in September. The infestation was checked successfully by hand-picking and baiting with poison bait. The adults were bred out and proved to be the common species **Feltia subterranea L.**

Fireworm. Fruit injured by the common fireworm (**Xylomuges eridania** Cram.) was discovered at Somerset.

TURNIPS. **Soft Rot.** Soft rot of turnips (**Bacillus carotovorus** Jones) was observed in November.

DISEASES AND PESTS OF ORNAMENTAL PLANTS

ANEMONE. A disease causing spotting of anemone leaves and subsequently the drying up of the plant is common here. The cause has not been discovered. A similar disease occurs on ranunculus.

ANTIRRHINUM. (Snapdragon). **Rust (Puccinia entirrhini** Diet. & Halw.) A large number of snapdragon plants badly infested with rust were found in a garden in Somerset in October, both uredo and teleuto stages being present. It is evident that the rust is carried over through the summer in this way. It is therefore important to destroy all infested plants as soon as they have finished flowering in early summer.

BOUGAINVILLEA. **Caterpillar.** The caterpillar destructive to bougainvillea leaves (See Annual Report, 1923) has been bred out and found to be **Acidalia stillata** (Guen.) (Cometridae). This pest is easily controlled by spraying with lead arsenate solution.

CARNATION. **Stem Rot.** Carnation stem rot (**?Rhizoctonia solani** Kuhn) was common in gardens towards the end of the year. Experiments with the organic mercury disinfectants are being carried out against this and similar fungi.

CHRYSANTHEMUM. **Rust.** The rust **Puccinia chrysanthemi** Roze was found on Chrysanthemum plants in several localities.

FERNS. **Aphid.** Kerosene nicotine oleate was found to be very effective against the common fern aphid.

PALMETTO. **Palmetto Scale.** The scale **Comstockiella sabalis** (Comst.) has been giving a considerable amount of trouble on the endemic palmetto (**Sabal Blackburnianum** Glazebrook). A severe outbreak occurred on Smiths and St. Davids Islands during the summer. Efforts to control the scale by cutting off affected leaves and spraying with lime sulphur were largely ineffective owing to the scale secreting itself among the fibrous sheaths of the palm.

Affected trees in St. Georges were cut down to prevent the scale from spreading westwards.

Experiments are at present being carried out with parasites sent me through the kindness of Dr. E. W. Berger, State Entomologist of Florida.

PALMS. **Scales.** The scales **Pseudococcus nipae** (Mask.), **Fiorina fioriniae** (Targ.), **Chrysomphalos aonidum** (Linn.), **Lecanium tessellatum** Sign. and **Diaspis boisduvalli** Sign. have been troublesome on coconut and other palms and have necessitated spraying.

POINSETTIA. **Hawk Moth.** Larvae of the hawk moth **Erinnyis ello** L. caused rather severe defoliation of ornamental poinsettias in one locality in October.

ROSES. **Leaf-Cutting Bee.**. A bee of the species **Megachile** cuts circular holes in rose leaves. It could be controlled by destruction of the nests, which are usually found in old walls.

SAGO PALM. **(Cycas Revoluta). Scales.** The scales **Diaspis zamiae** Morg. and **Pinnaspis aspidistrae** (Sign.) were found on the leaves of sago palms.

SWEET PEA. **Streak.** An outbreak of what was very probably streak disease, apparently rather common in Bermuda, was treated with marked success by watering with potassium cloride 1½ ozs. to 10 gals. water, pruning off the diseased parts and spraying with Pyrox. What is probably the same disease occurs on Fava beans.

Caterpillars. The larva of **Phytometra oo.** Cram. is injurious to seedling sweet peas. It can be controlled by the usual arsenicals.

TAMARISK. **Blight.** Work was carried out on a peculiar browning of the tamarisk hedges on the North Shore. It is not considered that this was due to a fungoid or insect organism.

MISCELLANEOUS

Lizards. Specimens of lizards caught at the Station during July were identified by Dr. E. L. Mark as **Anolis** sp. and **Eumeces longirostris** Cope. The former probably originated from a consignment liberated by Mr. T. J. Harris in 1905. The latter is an endemic species.

Examination of the alimentary canals of the first-named lizard showed that they feed on ants (mainly **Pheidole megacephala** Fabr.), cockroaches, flies, plant bugs and other small insects. These lizards are not common in other parts of the islands. Persons wishing to establish them in outlying parts should apply to the Station.

In Porto Rico a detailed investigation has been carried out on the food of the lizards present there and the conclusion has

been arrived at that "their value in preventing an enormous increase in numbers of some insects now regarded as only minor pests, can with difficulty be realised." (J. Dept. Agr. Porto Rico. Vol. 7, No. 4, Oct., 1924).

Scorpion. A few specimens of scorpion identified by Dr. Mark as **Neophrynus (Tarantula) palmata** have been found in shops in Front Street. This species is harmless to man.

Snails.. Tests of various substances have been made against the spiral snail **Rumina decollata** L. The following substances were found to be toxic to the snails when powdered or sprayed on and could therefore be used as barriers: Sodium fluoride (dry), sodium fluoride (strong solution), airslaked lime, nicotine dust, powdered alum, strong alum solution, calcium cyanide.

It is considered that clean cultural methods are the most effective means of dealing with this snail.

Respectfully submitted,

LAWRENCE OGILVIE,

Plant Pathologist.

5th May, 1926.

Report of the Inspector of Produce for the Season 1924–1925

The Director of Agriculture,

I have the honour, under the provisions of The Agricultural Inspection Act, 1921, to forward my report on the inspection of produce and lily bulbs shipped from the Colony during the season of 1924-1925, seed potatoes imported during the same period, the marketing of Bermuda produce in New York, and other duties performed.

INSPECTION OF SEED POTATOES

Garnets. There were imported from Nova Scotia 6,676 barrels of Garnet potatoes by steamer. A schooner brought 650 barrels, of which about 75 per cent. were lost by rot.

Bliss Triumphs. From 19th January to 4th March, 1925, there were imported 422 barrels from Wisconsin and 1,368 barrels from New Brunswick. Of the 1,368 barrels, 291 were lost by rot. These two lots were for March planting to supply seed for fall planting.

For direct fall planting there were imported as follows:

From.	Barrels.
Long Island, N. Y.	2,272
Belmont, N. Y.	188
Nebraska	3
Atlanta, N. Y.	20
New Brunswick	409
	2,892

Cobblers. This seed was imported for planting to produce a crop intended mainly for home consumption. In all there arrived from the United States 512 barrels, of which 60 barrels were lost by rot.

Quality of Seed Imported. The Garnets imported were on the whole of good quality, in good condition, and true to type. The barrels and packing were up to the standard of former years. The Triumphs from Long Island and Belmont were of good quality and true to type, but the grade was much under the average of previous years. The same remarks apply to the small importations from Atlanta. Those from New Brunswick were true to type and of good grade and quality, but had suffered somewhat from frost. The Cobblers were on the whole of good quality and grade, except some of the early importations.

Yield. The acreage under potatoes was about the same as last year. Triumphs yielded a crop much below the average, due mainly to the high winds which happened at the time when the plants were in full foliage and to leaf-roll which affected very seriously the large part of those from Long Island. Garnets also fell below the average. Though but very slightly affected by leaf-roll, the crop suffered heavily from drought and high winds. Cobblers gave a very good return.

INSPECTION OF PRODUCE

Green Vegetables. On 29th November, 1924, the green vegetable season opened with a shipment of 54 crates. The same ship took 92 barrels of potatoes and 137 barrels had preceded on 22nd November.

Throughout the season the green vegetables may be described as fairly good with exception of celery.

Fava Beans. These were of good quality, the yield was fairly heavy and there was comparatively little of the disease which affected the crop in the two previous years. On 2nd May further shipments were prevented because of infestation by the Mediterranean fruit fly.

Beets. This crop was on the whole up to the standard, though in some cases, as in previous years, there was too heavy top.

Carrots. The same remark as to top applies also to carrots.

Celery. The celery crop was poor throughout. Unfavourable weather induced blight and this condition prevailed during the whole season, thus reducing the yield to about 60 per cent. of that of 1923-1924.

Kale. This crop was on the whole good, although for a period in the middle of the season much of it showed yellow leaves on account of dry weather. A special report on this condition was forwarded at the time.

Lettuce. Lettuce did not attain the standard of former years either in quantity or quality.

Parsley. Parsley was good throughout the season. Full details will be found in the marketing report.

Onions. The quality of this crop was good, but the quantity was very small.

Produce Rejected on First Inspection. The percentages of produce rejected on first inspection were as follows: Celery, 4.6; other green vegetables, 2.6; onions, 10; and potatoes, slightly over 5. Most of this produce was made good with respect to the defects found therein (under size, slackness, improperly coopered or nailed, poor crates, etc.), and was accepted on the second inspection.

Appeals and Prosecutions. None.

Quantities Shipped. The following quantities of produce were shipped:

	Canada	West Indies	United States	Totals.	
Beans, Fava	—	—	2,970	2,970	bushels
Beans, Lima	—	—	9	9	"
Beans, String	—	—	2	2	"
Beets	—	—	18,263	18,263	"
Carrots	—	—	62,620	62,620	"
Celery	140	—	41,070	41,210	"
Kale	—	—	26,118	26,118	"
Lettuce	—	—	4,185	4,185	"
Onions	10,248	1,622	9,700	21,570	"
Parsley	—	—	56,579	56,579	"
Peas	—	—	4	4	"
Potatoes	28	1,948	21,512	23,488	barrels
Tomatoes	624	—	—	624	bushels
Turnips	—	—	631	631	"
Miscellaneous	3,392	35	250	3,677	"

Total number of green vegetables shipped, 216,891 bushels.

SUPERVISION OF CHILL-ROOMS.

From 17th January, 1925, until 15th June, 1925, I was in New York employed in investigating the market conditions there, observing the condition of shipments on arrival and exercising a general supervision over matters affecting the industry. During my absence the supervision of the chill-rooms was performed by the Assistant Inspector who reports a continuation of fairly satisfactory conditions.

OBSERVATIONS ON NEW YORK MARKET CONDITIONS.

The following abstracts are from the Inspector's diary, and are published with the object of illustrating the nature of the information gathered and work performed. Director.

17th January. Left Bermuda by the S. S. Fort Victoria. The chill-room temperature during the voyage was satisfactory.

Arrived in New York at 10:30 a.m., Monday, 19th, and after obtaining hotel acommodation went immediately to the market where I found large quantities of vegetables of good quality, most of which were selling at low prices.

21st January. On going into market this morning found some carrots and parsley still unsold; the former owing to heavy

receipts from Texas; and the latter owing to an effort of the receivers to hold out for $3.00 per crate.

Took up with the receivers the question of potato prices and urged them not to sell at less than $14.00. My proposal did not exactly coincide with the views of the receivers, although a few were selling at $14.00 per barrel.

22nd January. There is still some parsley unsold this morning, and plentiful supplies arriving from Texas and other places. On checking up I found only some 1,500 barrels of potatoes in storage, and at once advised the holders to stiffen the price.

2nd February. Market for potatoes unchanged. Some Cuban potatoes on sale today. They are of a poor grade, but bright in colour.

5th February. Cuban potatoes are moving heavily to western markets, and consequently restricting the sale of Bermudas there.

6th February. A little more activity in the potato market at previous prices. Outlook more promising.

16th February. S. S. Fort Victoria arrived at 10 a. m., with 492 barrels potatoes and 8,757 crates vegetables, all in good condition. Commendable dispatch was shown in the handling of this cargo which was all in the market by 6 p. m. Many of the carrots were far too small for the trade and may thus adversely affect prices.

20th February. Reached Fall River at 5 a. m., to investigate sales of kale.

23rd February . S. S. Fort Victoria arrived at 4 p.m., with 750 barrels potatoes, 7,897 crates vegetables and 528 crates kale. By the strenuous co-operation of the dock staff and the Agricultural Inspector a midnight delivery was affected.

24th February. There was this morning an accumulation of two days' vegetables of all sorts. On examining the stuff received yesterday by the Fort Victoria I found most of it soft, a state of things which would have meant a serious loss to the farmers if another day's delay had been incurred.

5th March. Left at 5 p. m. for Fall River to again investigate kale.

10th March. The market for vegetables this morning is simply demoralized.

12th March. Viro potatoes in heavy supply and selling $11.00 to $13.00. About 50 per cent are No. 2's, indicating a small yield.

19th March. Florida celery in heavy quantity selling from $2.00 to $2.75 per crate.

2nd April. Florida potatoes today brought a top price of only $8.00. This drop in Floridas is bound to have its reflex on Bermudas.

3rd April. As forecasted yesterday, there was a drop in the price of Bermuda potatoes which are quoted at $11.00 to $12.00.

8th April. Left for Bermuda.

10th April. Arrived in Bermuda and resumed duty as Inspector of Produce.

30th May. Left Bermuda for New York by S. S. Fort Victoria having on board 510 barrels potatoes, 1,610 crates vegetables, 4,178 crates celery, 241 crates onions.

1st June. Arrived at New York at 10:30 a. m. Met Mr. A. J. Gorham on the dock; and after a little conversation went to my hotel and thence to market, where I found the conditions very discouraging, especially with respect to celery. At 11 p. m. went again to market, accompanied by Mr. Gorham. An attempt to raise the price of celery was fruitless on account of the large quantity of Florida celery, some of which was excellent, in cold storage, while ours was very poor and blighted.

2nd June. Florida celery from cold storage was good and bringing $1.50 to $3.00. Florida green was selling as low as 50 cents per crate. Consequently, Bermuda celery was selling very slowly, and the temperature, 96°F, did not tend to improve matters. About 500 crates sold to firms in Buffalo and Boston somewhat relieved the congestion. A small quantity of the celery by this boat was placed in cold storage.

13th June. Left by S. S. Fort St. George for Bermuda.

15th June. Arrived in Bermuda and resumed duty as Inspector of Produce.

INSPECTION OF LILY BULBS

From late in June until I left on vacation leave (16th July) I was engaged almost continually in the inspection of lily bulbs at the following packing sheds:

T. H. Doe, Paget.

Henry & Lee, Pembroke.

E. Worrall Outerbridge Co., Hamilton Parish.

Theodore Outerbridge, Paget.

H. L. Pearman, Pembroke.

Stephens Bros., Paget.

Certificates covering the inspection of 4,491 cases were issued for the season, of these the later ones were issued by the Assistant Inspector, Mr. E. L. Adams, as Acting Inspector of Produce.

The percentage of bulbs found to be affected with basal rot was much less than that of last season's crop. Marked improvement was also observed in the type of bulb, for most growers are endeavouring by selection to produce the earlier-blooming type, though it is regretted that a few continue to grow the late variety, though experience should have shown that this type is less profitable.

Mr. Ogilvie, our Plant Pathologist, is not sparing any effort to assist the growers in the production of disease-free bulbs true to type. If the growers will be advised by him, I am confident that it will be to their advantage.

REMARKS AND RECOMMENDATIONS

Produce. Reference has been made in previous reports to the desirability of growing beets with minimum top, of good shape and high colour. The grading of carrots was particularly poor during the season under report, for many were much too small, and as small carrots are unpopular, they are the last to be sold, and then at considerable reduction. Celery suffered not only from very keen competition, but also from poor quality. Potatoes were far from satisfactory, both with respect to size and quality. The shipment of No. 3 potatoes may—as a rule—be regarded as a loss. It is highly desirable to introduce other vegetables.

Packages. The crates for celery and kale now in use are firmly established, and have found much favour both with receivers and buyers. With respect to an improved package for onions and other vegetables, it should be strong; that now in use is well known to the trade, and while details of construction should be improved, the distinctive character of the crate should not be changed.

Count. The minimum number of bunched vegetables has been fairly well adhered to during the season.

Reduction of Number of Receivers. It appears more than ever desirable that the number of New York receivers of Bermuda produce, especially of celery, should be reduced. A movement in this direction is strongly recommended. The Act regulating the shipment of produce to Canada should be amended to include all farm products shipped from Bermuda.

Lilies. Lily bulbs of the Harrisii type should be grown to the exclusion of the later blooming type.

ACKNOWLEDGEMENT

I would again acknowledge the consideration and courtesy shown me by the New York dock officials of the Furness Bermuda Line.

Once more I would record my appreciation of the courtesy of Capt. N. E. Holmes, Wharfinger, for setting aside space for regrading produce.

My thanks are due to Mr. E. L. Adams, Assistant Inspector, and the Sub-Inspectors for the efficient manner in which they performed their duties.

Respectfully submitted,

G. E. WINTER,

Inspector of Produce.

Devonshire,

31st December, 1925.

Report of the Government Veterinary Officer for the Year 1925

The Director of Agriculture,

I have the honour to submit my report for the year ending 31st December, 1925.

It is with much satisfaction that I look over my monthly reports for the year, for they show that the health of and sanitary conditions surrounding live stock in the Colony have, as a rule, been satisfactorily maintained. Serious contagious or infectious diseases have not occurred.

Horses. All horses entering the Colony have been ophthalmically tested for glanders and farcy, and none have shown positive reaction. Other veterinarians have made tests, and have reported negative results also. This immunity is to a large degree due to the fact that dealers in New York and other ports, aware that rigid inspection is made here, are extremely careful in their selections for Bermuda.

Attention is called to the unsanitary conditions of many horse stables, especially in the country districts. I have repeatedly suggested improvements to the owners with respect to better floors, either wood or concrete. This step would make the stables more santitary and reduce the chances of loss of stock by tetanus.

Dairy Cattle. The sanitary condition under which dairy cattle are kept shows great improvement. The milk from the dairies is in most cases above standard, and though the percentage of butter-fat is in some instances low, this is principally due to the breed characteristics of many of the animals kept. The recent introduction of Guernseys is doing much to raise the standard above the 3 per cent. required by law. I am in position to speak definitely on the improved sanitary conditions above referred to, for in addition to the observations made while performing my private practice, as Veterinarian employed by the General Board of Health I am called in to visit all dairies at least twice yearly In this capacity I made about 950 examinations for bovine tuberculosis. Of the diseased cows slaughtered (10) post mortem examinations revealed scattered tuberculosis in the lungs, and in one case only was mammary infection observed.

Dogs. The passing of The Dogs Act, 1925, is a step in the right direction, for not alone will it contribute to the Public Treasury, but it will afford great relief to breeders of poultry and other small live stock.

Poultry. The poultry industry has increased greatly during the year, and one has but to visit the poultry exhibitions to verify this statement. The specimens of the many varieties now shown

have increased in numbers and improved in quality. The recent importation of good breeding stock will further improve the stock previously brought in. I would advise breeders to raise general purpose birds in preference to the lighter types, because the former should give more profit when the production of eggs and table poultry are both considered.

Storage of Meat for Food. The premises in which meat is stored have been found to be generally in excellent condition when inspected at frequent intervals.

Inspections Under Regulations. The inspections under Regulations made by the Board have already been referred to, and have included visits to all passenger boats entering port and the inspection and treatment of animals imported, the inspection of chill-rooms and other premises used wholly or in part for the keeping of animals or the storage and sale of carcases, the testing of dairy animals for tuberculosis. As the Veterinarian of the General Board of Health, already referred to, I have also examined and tested dairy animals and examined dairies and cow stables. I have also examined cases of alleged cruelty to animals under the provisions of The Protection of Animals Act, 1923.

Agricultural Exhibition. I desire to state that my observations among the domestic animals of the Colony have convinced me that the Agricultural Exhibitions held from year to year are exercising a pronounced beneficial influence in the breeding and care of live stock.

Acknowledgement. In conclusion I wish to take this opportunity to express my appreciation of the manner in which the members of the Customs and Police Departments have assisted me in the performance of my duties, especially at the dock.

Respectfully submitted,

R. L. TUCKER,

Government Veterinary Officer.

Flatts, Bermuda,

1st May, 1926.

Report by the First Agricultural Assistant of Egg-Laying Contest

The Director ofAgriculture,

The first Egg-Laying Contest held in the Colony was brought to a close on 14th February. The contest, which was of four months' duration, was conducted at the Agricultural Station. The credit for initiating the contest was due to the Bermuda Poultry and Pet Stock Association, but the splendid co-operation between the Board and Department of Agriculture and the Poultry Association was the deciding factor of its success.

Though the contest was of short duration and trap-nesting was not undertaken, it provided opportunity to gain practical experience, and suggested useful ideas for future similar events. On the whole, the general public were very interested, but there was a tendency with a small section of the community to view the contest from the competitive view-point only. While the competitive element did enter into the contest, the major considerations were the results obtained from a breeding standpoint.

The contest consisted of ten pens of four pullets each, a total of forty pullets. The total number of eggs laid was 122¼ dozen, an average of 36.67 eggs per bird. The heavy breeds (24 birds) averaged 36.63 and the light breeds (16 birds) averaged 36.67 eggs per bird. The highest pen in the heavy breeds averaged 64 eggs per bird and the lowest pen averaged 17.5 eggs per bird. The highest pen in the light breeds averaged 49.75 eggs per bird and the lowest pen 28 eggs per bird.

The birds consumed 1,400 pounds of feed valued at £13-2-6. The eggs produced were sold to the King Edward VII Memorial Hospital at current market rates, and realized £24-11-6, a profit of £11-9-0 above cost of feed or a fraction over 5/8 per bird.

FINAL RESULTS:

Position	Name of Owner.	Breed	No. of 1st grade eggs laid	No. of 2nd grade eggs laid	Total no. of eggs	Market value of eggs
1st.	Major H. H. Kitchener	Rhode Islands Red	207	49	256	£4 1 10
2nd.	Major H. H. Kitchener	White Leghorn	199	—	199	3 1 3
3rd.	Mr. H. P. Motyer	Barred Rock	149	—	149	2 11 4
4th.	Mr. Jas. Christensen	White Rock	144	—	144	2 12 11
5th.	Mr. W. R. Evans	Brown Leghorn	140	8	148	2 8 6
6th.	Major J. S. Bartrum	White Wyandotte	140	1	141	2 7 0
7th.	Mr. G. W. Fisher	White Leghorn	127	2	129	2 13 11
8th.	Mr. W. R. Lightbourn	Barred Rock	119	—	119	2 0 0
9th.	Mr. R. Christensen	White Leghorn	107	5	112	1 19 0
10th.	Mr. P. C. Hammond	White Rocks	70	—	70	1 5 9

The following prizes were awarded, which were presented to the owners of the winning pens by Mr. E. F. Zuill, M.C.P., Acting Chairman of the Board of Agriculture, at a meeting of the Board held at the Agricultural Station:

Gold Medal for pen laying largest number of marketable eggs. Won by Major H. H. Kitchener's Rhode Islands Reds.

Silver Cup presented by Messrs. Pearman, Watlington & Co., Agents for Purina Feeds, for heavy breed pen laying largest number of marketable eggs. Won by Major H. H. Kitchener's Rhode Island Reds.

Silver Cup for light breed pen laying largest number of marketable eggs. Won by Major H. H. Kitchener's White Leghorns.

Silver Cup for heavy breed pen laying second largest number of marketable eggs. Won by Mr. H. P. Motyer's Barred Rocks.

Silver Medals for pens laying largest number of marketable eggs during each four weeks period:

1st period, Major H. H. Kitchener's White Leghorns.

2nd. period, Mr. James Christensen's White Rocks.

3rd. period, Major H. H. Kitchener's Rhode Island Reds.

4th. period, Major J. S. Bartrum's White Wyandottes.

The 1925-1926 Contest commenced on 1st November, 1925. The number of pullets to a pen was increased from four to six and one in reserve. Trap-nests have been installed, and other improvements for the comfort of the birds and the convenience of the attendant were effected. While the weather was not very favourable at the beginning, the results to the end of the year were satisfactory.

Respectfully submitted,

W. R. EVANS,

First Agricultural Assistant.

3rd February, 1926.

APPENDIX A.

Expenditure (Exclusive of Salaries) for the Year Ended 31st December, 1925

1. FEES TO MEMBERS OF BOARD.

Appropriated by Act No. 35, 1924				£70	0	0
Paid to members for attendance	64	16	0			
Unexpended balance	5	4	0			
	£70	0	0	£70	0	0

2. GENERAL GRANT.

Appropriated by Act No. 35, 1924..				£2200	0	0
" " Resolve No. 24, 1925				90	0	0
Labour on experimental plots, lawns, flower beds and glass-houses, and care of live stock..	1306	7	4			
Remunerations to argicultural students	94	11	0			
Preparing Montrose field	41	1	9			
Carting and plowing	111	2	11			
Manure and fertilisers	72	7	0			
Seed potatoes, seeds, bulbs and plants	129	10	9			
Live stock—feed, bedding and incidentals	224	11	2			
Repairs and renewals of tools, implements, etc.	128	2	7			
Renewals of furniture	17	1	5			
Cleaning offices	14	14	10			
Stationery and printing, local .	73	18	2			
Stationery and printing, foreign	23	13	4			
Agricultural Clubs, Prizes to .	8	0	6			
Potato Competition, Prizes to ..	25	0	0			
Sundry	17	19	9			
Unexpended balance	1	17	6			
	£2,290	0	0	£2,290	0	0

3. INSPECTION SERVICES. MARKET INVESTIGATION AND CONTINGENCIES.

Appropriated by Act No. 35, 1924				£1,250	0	0
Inspection at dock	492	15	2			
Inspection of seed potatoes in the United States, and other services...	86	1	8			
Representatives in New York Market—G. E. Winter,.....	199	18	1			
A. J. Gorham	187	9	0			
Investigations in New York relative to celery delayed, and other services	33	17	2			
Compensation paid to farmers for fava beans offered for shipment on 2nd. May, 1925	84	6	0			
Lily bulbs for distribution at British Empire Exhibition....	60	11	0			
Cables	57	15	2			
Supplies and contingencies....	47	6	0			
Unexpended balance			9			
	£1,250	0	0	£1,250	0	0
Apparatus, books and conten-						
Supplies and contingencies	61	5	0			

4. ERADICATION OF ANIMAL DISEASES.

Appropriated by Act No. 35, 1924				£100	0	0
Compensation to owners of condemned stock	65	0	0			
Supplies and contingencies	30	11	6			
Unexpended balance	4	8	6			
	£100	0	0	£100	0	0

5. PURPOSES OF PLANT AND BULB DISEASES AND PESTS ACT.

Appropriated by Act No. 35, 1924				£250	0	0
Labour	64	12	6			
Fungicides and insecticides	84	14	4			
Equipment and contingencies	100	2	5			
Unexpended balance		10	9			
	£250	0	0	£250	0	0

6. IMPROVEMENT OF LIVE STOCK.

Appropriated by Act No. 35, 1924				£100	0	0
Purchase of breeding stock viz, pigs, goat and poultry	38	2	8			
Supplies and contingencies	61	5	0			
Unexpended balance		12	4			
	£100	0	0	£100	0	0

7. ANNUAL EXHIBITION.

Appropriated by Act No. 35, 1924				£400	0	0
Labour, material and contingencies	400	0	0			
	£400	0	0	£400	0	0

8. PURCHASE OF BOOKS AND SCIENTIFIC APPARATUS.

Appropriated by Act No. 35, 1924				£50	0	0
Apparatus, books and contingencies	48	7	9			
Unexpended balance	1	12	3			
	£50	0	0	£50	0	0

9. DEPARTMENTAL CONTINGENCIES, TRAVELLING EXPENSES OF OFFICERS OF DEPARTMENT, TELEPHONES, LIGHTING, ETC.

Appropriated by Act No. 35, 1924				£120	0	0
Carriage hire	36	3	0			
Telephones	12	10	0			
Electric light and power	7	4	4			
Printing, local	20	0	0			
Foreign postage	9	0	0			
Unexpended balance		1	9			
Supplies and contingencies	35	0	11			
	£120	0	0	£120	0	0

10. EXPENSES IN CONNECTION WITH EGG-LAYING COMPETITION.

Appropriated by Act No. 35, 1924 ..				£25	0	0
Labour, material and contingencies	24	19	1			
Unexpended balance			11			
	£25	0	0	£25	0	0

11. GROWING TREES FOR ARBOR SOCIETIES.

Apropriated by Act No. 35, 1924				£100	0	0
Purchase of trees, and freight ...	63	14	1			
Labour and contingencies	18	16	10			
Unexpended balance	17	9	1			
	£100	0	0	£100	0	0

12. RENT ALLOWANCE TO PLANT PATHOLOGIST.

Appropriated by Act No. 35, 1924..				£100	0	0
Expended	£100	0	0			
	£100	0	0	£100	0	0

13. SUPPLEMENTARY APPROPRIATION RESOLVE.

Appropriated by Resolve No. 2, 1925				£28	14	5
Rent allowance of Plant Pathologist from 27th September to 31st December, 1923.	26	2	2			
Increment on salary of Plant Pathologist from 27th September to 31st December, 1924	2	12	3			
	£28	14	5	£28	14	5

APPENDIX B.

Statement of Reimbursements to Government, and Value of Produce Supplied to Other Institutions during the Year Ended 31st December, 1925.

1. REIMBURSEMENTS TO GOVERNMENT

Sale of Vegetables, etc.	£44	6	7
Sale of Registered live stock	35	0	0
Live stock fees	41	18	6
Registration fees from seedsmen	2	10	0
Miscellaneous receipts	6	3	8
	£129	18	9

2...PRODUCE SUPPLIED TO OTHER INSTITUTIONS.

Milk to King Edward VII Memorial Hospital	£97	18	3
Vegetables to King Edward VII Memorial Hospital	36	2	3
Vegetables to Hamilton Gaol	12	15	0
Vegetables to Nursing Home	3	5	6
Vegetables and plants to Bazaars	14	3	0
Vegetables to Lunatic Asylum	15	8	0
	£179	12	0